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VIEWS, NEWS AND INTERVIEWS.

It is said that nearly $14,000 worth of electricity is used nightly in New York city for illuminating purposes. By a late calculation there are 1,030,468 electric lights, both arc and incandescent, in use in the city, with an estimated total candle-power of 50,000,000.

Chief Electrician Rau, of the Milwaukee Street Railway Company, will soon have completed the finest private telephone system in the State of Wisconsin. It will cost $10,000, and cover more than 100 miles. The exchange has been fitted up in the Broadway offices of the company. Central will be known in the Wisconsin telephone directory as 478, and will connect with 25 stations. The central station will have connection by four trunk lines with the Wisconsin Telephone Company. Booths will be used at Wauwatosa, South Milwaukee, Whitefish Bay and North Greenfield, or in small boxes, which will be hung upon the center posts.

It is expected that by February 15 Siemens & Halske will have ready the electrical plant which is to light the City of Mexico. The entire plant will furnish 40,000 incandescent lights and 600 arc lights for the city. Most of the machinery and supplies for this plant has been sent from New York, including poles and other apparatus.

The Appellate Division of the Supreme Court in Brooklyn has affirmed the decision of Justice Van Wyck, permanently enjoining the city authorities from ratifying the franchises granted for an unlimited period by the aldermen to the East River & Atlantic Ocean Railway Company, to construct and operate over 25 miles of new trolley routes.

The incorporation of the Steel Wire Trust was completed at Chicago on January 4. The company has a capital of $87,000,000. The incorporators are John W. Gates, Isaac L. Elwood and Elbert H. Gary, all of Chicago. The main office of the company will be in Chicago. The object, as stated in the application for a license, is the manufacturing of steel wire and all business relating thereto.

The new Board of Police of New York city has decided to establish telephonic communication between police headquarters in the Borough of Manhattan and Long Island City and the boroughs of Richmond and Queens. A headquarters will also be fixed at Stapleton. Superintendent Brennan, of the Telegraph Bureau, was authorized to proceed at once with this work, which will require a long time and considerable expense.

A company with $1,000,000 capital has been formed to develop the water-power of the Pend d'Oreille River, near its confluence with the Columbia, and deliver electric power into Rossland, British Columbia, Trail and other camps of the Kootenai district. It is proposed to develop 2,000 horse-power, and to utilize the present works of the Goodhugh Syndicate, of New York, which developed 750 horse-power, to work placer deposits at the southern Pend d'Oreille. Other installations are also in prospect.

FIG. 1.—INTERIOR VIEW OF THE NIAGARA FALLS POWER COMPANY'S STATION, SHOWING EXTENSION IN PROCESS OF EQUIPMENT.—Photographed from Gallery.

ELECTRIC POWER DEVELOPMENT AT NIAGARA FALLS.

Local Uses of Electric Current and the Transmission of Power to Buffalo.

IN A SHORT TIME 25,000 HORSE-POWER WILL BE AVAILABLE.

The closing months of the year 1897 were marked by great activity in the power development at Niagara Falls, both in the preparation for larger quantities of power and by the utilization of the power which had already been developed. There is every prospect also that the coming year will see not only the building of a number of new factories at Niagara Falls, which will consume large blocks of power, but also the introduction of electric power in Buffalo in large quantities, by means of the transmission lines which have recently been erected.

At the close of last year the Niagara Falls Power Company had but 15,000 available horse-power, but such progress has been made on the extension of the plant that it will be the question of but a few months before an additional 25,000 horse-power will be available in addition to the present plant. The wheel-pit and the main buildings are already completed, and nothing remains to be done but the installation of the hydraulic and electric machinery. The arches and other masonry work designed to support the turbines and

dynamos are finished, as is also a considerable part of the iron work, such as supports for the bearings, gratings and the bases for several of the turbines. A large force of men employed by the I. P. Morris Company, of Philadelphia, who have the contract for the hydraulic machinery, has been at work for several months, and the result of their labor is apparent when one descends into the wheel-pit extension and there sees the turbines now being installed. It is expected that within a few weeks another unit will be ready for operation.

The Westinghouse Electric and Manufacturing Company have already commenced their part of the work by placing in position the switches, rheostats, instrument cases, etc., which complete the installation of the first switchboard. This switchboard structure, it may be mentioned, is designed to take care of five dynamos, with the corresponding number of feeder circuits complete; the remaining five dynamos to be operated from another similar structure, which will be placed in the power-house extension.

Work in every department is being pushed forward as rapidly as possible, as there is already such a demand for power at Niagara Falls and in Buffalo, that the present plant is barely capable of fulfilling the requirements. The only part of the work that is complete is the building itself, and this presents a very imposing appearance from whatever side it is viewed. More especially is this the case when visited at night, when the lighting up of the outside by numerous arc lamps and the brilliant lighting of the interior, with the whirr of machinery operating at full load, impresses one with the animation of the whole scene.

Within a half mile of the power-house, this same animation appears in the long line of factories now utilizing power in the manufacture of many materials which it has been possible to make on a commercial scale only by the utilization of electric power. Most of the factories have been fully described in previous issues of the ELECTRICAL REVIEW, but there are one or two which have been recently put in operation, and to which it might be well to devote a few words.

Just beyond the works of the Pittsburgh Reduction Company are the buildings of the Mathieson Alkali Works, which cover a large area of ground, and are now manufacturing sodium hydrate and bleaching powder in large quantities. Commencing November 25, 1897, with one unit of 200 horse-power, they have gradually increased the number to seven, this number using 1,400 horse-power; and within a week they will have their whole plant in operation and will use the total amount of power contracted for, amounting to 2,000 horse-power. The chief product, derived from their batteries by electrolysis, is sodium hydrate and chlorine gas, the latter of which is carried off in pipes and used in the manufacture of bleaching powder. Both of these products are in demand, and this company expects to operate to their full capacity from now on. A view of their very handsome transformer room is presented.

Beyond the village of Echota is another and smaller factory which has recently commenced operation; namely, the Oldbury Electro-Chemical Company, who are engaged in the manufacture of phosphorus, and use 400 horse-power in their batteries.

FIG. 2.—TRANSFORMER BUILDING, MATHIESON ALKALI WORKS, NIAGARA FALLS.

The Acetylene Light, Heat and Power Company has also been extending its operations during the last few weeks, and are now running close to the full capacity of their plant, the product which they turn out being carbide of calcium.

Other factories are preparing to extend their plants, and some have already installed greater and larger units than they have hitherto been using, notably the Buffalo & Niagara Falls Electric Light and Power Company, who are now using two 400-horse-power 2,000-volt Tesla induction motors, which are probably the largest alternating-current motors in the world. With these motors is supplied enough power to drive the lighting dynamos in the station, which furnish arc and incandescent light to more than one-half of the city.

But it is not only at Niagara Falls that the demand for power has become urgent. In Buffalo the Cataract Power and Conduit Company have been making great preparations to introduce power which is to be delivered over the transmission line already complete and in operation. During the Fall of 1897 the number of transmission circuits was doubled, the work being done by J. G. White & Company, of New York, the same company which installed the first line. The new cables have been placed on the same set of poles as the first set, on the opposite end of the cross-arms, and the line as it now stands is capable of transmitting 10,000 horse-power at 11,000 volts pressure.

In the transformer building, at the Niagara Falls end of the line, seven more transformers have been placed in position, making a total of 10 each transformer being of 1,250 horse-power capacity, and with these have also been installed the necessary switchboards, lightning arresters and ground detectors. Already 3,000 horse-power is being transmitted, 2,000 horse-power being consumed by the Buffalo Street Railway Company, and the rest by the Great Northern Elevator and the new Electric Elevator, while a further supply will shortly be demanded by the Union Dry Dock Company. Also the Buffalo General Electric Company has contracted for 3,000 horse-power, which amount they will apply to the lighting of the city.

The two grain elevators mentioned above are among the largest in the world, and were completed last Summer at a cost of nearly $1,000,000. The power from the Falls, at a pressure of 11,000 volts, is delivered at the main transformer station of the Cataract Power and Conduit Company, where the pressure is lowered to 2,200 volts, and from there passes out on secondary cables to the consumers. The largest of these at present is the Great Northern Elevator, which has a capacity of 3,000,000 bushels of grain, and is one of the few absolutely fireproof buildings in this country. Most of the power is used in the motor circuits, the motors being of the Tesla induction type. One 50-horse-power motor operates the cable to move the marine towers, and also the large fan which keeps the dust from the elevator boots and from the sweepers. The machinery for elevating the grain from vessels is driven by a 100-horse-power motor, while other motors are used to drive the various machines used in transmitting and cleaning the grain. In fact, all of the power used in the entire building is taken from the mains leading from the main transformer station.

The Electric grain elevator is similar to the Great Northern, though on a somewhat smaller scale, as may be shown by the amounts of power which each has contracted for, the Great Northern taking 1,000 horse-power and the Electric elevator 450 horse-power.

Besides these large blocks of power, it is understood that the Buffalo General Electric Company will undertake, in the near future, to supply customers with small blocks in addition to the 3,000 horse-power which they expect to use in fulfilling contracts for lighting the city; also the Buffalo Railway Company will, no doubt, use a larger supply as soon as it can be furnished them. It is evident, therefore, that the prospects for the coming year are very bright, and it will be a question of but a few years before the Niagara Falls Power Company will be operating to the full capacity of their plant.

The Niagara Falls Hydraulic Power and Manufacturing Company have also been extending their plant at the foot of the bluff below the Falls. They have already signed a contract with parties who are about to build a plant to manufacture chlorate of potash, using 500 horse-power in their process.

The Acetyline Gas Machine Company has also decided to locate its plant at Niagara Falls, and will soon erect a factory near the new arch bridge.

Now that the Niagara Falls power development has proved so successful on the American side of the river, it is expected that the Canadian Niagara

Power Company will soon commence operations on the other side of the river, in order to furnish power demanded in Toronto and other Canadian centers. Our neighbors on the other side of the river have recently become enthusiastic on the subject and have formed the Canadian Power League, which has for its object the promotion of electrical development, and which proposes to encourage all movements which have been taken in that direction.

While it will be many years before an approach will be made to the development of the power of Niagara Falls to its full capacity, still from present prospects it would seem that this section of the country will soon be the scene of the greatest development of power from natural sources in the world.

TOLD IN THE DYNAMO-ROOM.

Everything was running smoothly at the Centreville station. Jim had changed the burned-out converter at Mr. Brown's house for a new one, and as his circuits were in first-class condition, owing to the foresight of Mr. Evans, who, the Fall before, had put on some extra help and had thoroughly overhauled the entire system, the sometimes fierce storms of the Winter caused little interruption to the service. About the only thing Jim had to do was connecting additional lights here and there. He had just completed a job of that kind, and after supper returned to the station, his duties requiring him to remain there until midnight, so as to be on hand in case of trouble.

"Well, Jim, how many lamps did you hitch on to-day?" asked the engineer.

"Just 20—over at the Metropolis Hotel. If business keeps up like this we'll soon have to have another machine. By the way, whom do you think I met at the hotel?"

"Why, the clerk, of course," spoke up Bert, who had just moved the exciter rheostat up another notch, as the load was creeping up pretty fast.

"Well, yes," replied Jim, "but I also met that sporty salesman from Chicago—Reed, I think his name is. I told him Evans wouldn't be home till to-morrow, so he said he'd drop in some time this evening and see what we needed in the line of supplies. I tell you the drummers have a good time. He bought me a cigar, and it wasn't a telephone cigar, either."

"And what is a telephone cigar?" asked the engineer.

"Ha! ha! One that you smoke in Centreville and smell in Chicago."

The engineer was just about to hurl a wrench at the lineman's head, when the door opened and in walked what proved to be the Mr. Reed Jim had just been telling of.

His language and demeanor showed that this was not his first visit to the plant.

"Good evening, Mr. Benson," shaking hands with the engineer; and "How-de-do, Jim?" to our lineman, were his salutations. Turning to Bert, he asked, "And how is that generator? Does she spark well this evening, Mr. Edison?"

"Why no, not a particle, since you left us a sample stick of that Cyclone commutator compound. I was telling Mr. Evans the other day he'd better order a dozen sticks."

"Great stuff that; absolutely prevents sparking. Had a striking illustration of that fact last week in Boston, where my friend Ed—you know Ed Nolan, of course—where he goes once a month for our house. Well, Ed had become acquainted with a rather good-looking young lady there, father worth half a million and so forth, and Ed was making great progress, almost ready to be accepted, when all of a sudden his visits were received with unusual frigidity; in fact, there was such a coolness in the parlor that, after a few calls, Ed gave it up. And what do you think was the trouble? Why, Ed always carries a few sample sticks of the Cyclone compound around with him, and, of course, with that in his pocket, sparking was impossible."

A volley of laughter greeted this remarkable story, and Jim remarked:

"I'm sorry you do not live in Centreville, Mr. Reed, or I'd propose your name as an honorary member of the Ananias Club."

"Oh, thanks; I belong to too many clubs now," modestly rejoined Mr. Reed.

"By the way, Mr. Reed," asked Benson, the engineer, "what ever became of that fellow, Freeson, who sold us our first alternator? I heard the other day from some carbon salesman that he had left the Imperial Company. I understand he is a dear friend of yours."

"Dear friend of mine? Well, yes, he proved rather dear; cost me just $250 to know him," sadly answered Reed. "He is undoubtedly the cheekiest and nerviest specimen I ever came across. He never dared to visit a town but once. Of course, he got fired from the Imperial Company after a while, and what do you suppose he went at next?"

"Oh, started to travel for a supply house, I suppose," spoke Jim, trying to be facetious.

"Well, no, not exactly; but he called on old man Hoffheimer down in Chicago, who, as you know, makes those patent gaskets, and gave him such a successful talk about his experience with engineers in general, and his ability to sell gaskets in particular, that the old man hired him for a year to travel through Wisconsin, Michigan and Minnesota to sell his gaskets. Freeson started out the first of the week, having been duly provided with a 2,000 mile book on the Northwestern and Milwaukee roads, as well as a $150 roll of expense money. The first stop was Milwaukee, and having met several congenial spirits during the day, Freeson felt pretty jolly by evening, and becoming rather boisterous at one of the places he and his friends visited, they suddenly found themselves ejected into the alley. During the melee that took place somebody relieved Freeson of his money and mileage books, and our jovial chap had to borrow enough money from the hotel-keeper to pay his fare to St. Paul. Before taking the train he wired old Hoffheimer as follows: 'Send two new mileage books and $100, care Hotel Ryan, St. Paul. Will explain by letter.' Now, old Hoffheimer had one good quality—he would never let one of his men suffer on the road for want of money. After Freeson arrived at St. Paul he duly received the tickets and expense money the following day. With them came a rather sharp letter from the old man, expressing surprise at Freeson's unusual demands, and winding up by saying: 'Now, I shall expect a full explanation by return mail. Of course, I can easily guess what became of the money, but what in blazes did you do with the mileage books? Did you sleep on a merry-go-round?'"

Reed got no further, the hearty laughter of his audience cutting short any further remarks on his part.

"I'll bet that's the only joke old Hoffheimer ever got off," laughed the engineer. "I used to see him quite often when I was running the 'Isabella' on Lake Michigan, and a soberer and more dignified fellow I never knew."

"Guess that's the only way he could account for Freeson's using so much mileage in one night," sagely suggested Jim, with a chuckle.

"Well, boys, I must be going back to the hotel," remarked Mr. Reed. "I have to write to the house yet, and send in some orders. I'll see Evans to-morrow and sell him a lot of our new Moonshine lamps. It's the greatest lamp ever produced, and we are selling them so fast that our factory is running 25 hours out of 24. Good night, boys!"

"That must be a good place to work overtime," remarked Bert, as he thoughtfully rubbed a little of the Cyclone compound on one of the commutators that showed a little sparking, after which he began to investigate the mysteries of a lunch-pail of generous proportions, and placed the coffee-can on one of the alternator fields, where it soon sent forth an appetizing aroma of chicory and burnt peas.

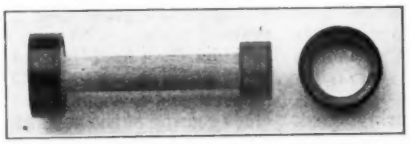

FIG. 1.—VARLEY MEDICAL AND TELEPHONE COIL BOBBIN.

FIG. 2.—VARLEY BOBBIN WITH PRIMARY WINDING.

FIG. 3.—FINISHED VARLEY COIL.

FIG. 4.—VARLEY SECONDARY WINDING ON MANDREL.

An Improved Method of Magnet Winding.

Owing to the enormous amount of detail work consequent upon having to make an infinite variety of cores, heads, washers, etc., the Varley Duplex Magnet Company, Jersey City, have lately introduced a form of sectional winding which is complete without core or heads, and can readily be slipped on the proper core, fitted with one head, as shown in Fig. 4. Fig. 1 shows the manner of making medical and telephone induction coil bobbins. Fig. 2 shows the bobbin with primary winding. The secondary windings are then wound on separate mandrels, similar to the winding in Fig. 4, and then slipped on the primary winding, after which the second head is properly glued on, as shown in Fig. 3.

The specific advantage of this style of winding is in the fact that telephone companies can make their own cores, washers and bobbins, etc., thereby saving the transportation on them to and from the Varley company's factory, as has been done heretofore.

MULTIPLE RATE METERING.

BY EUSTACE OXLEY.

It is not probable that "methods of charging for current" is a subject that will now command the same general interest that has heretofore been shown both in this country and abroad.

The reading public is growing tired of a discussion that has had little result, except the production of a great variety of conflicting opinions. Still, it is hoped that a question of such importance may not be without interest, provided it can be shown that a long step has been taken in the direction of its solution. A new system of applying the double-rate method of charging has been employed by a large electric lighting corporation in this country for some five or six months past. Broadly speaking the method is well known, but its employment in this instance has been under novel conditions. The marked success which has followed, and the results that have been accomplished in solving problems of much importance to all generating companies, will lend interest to a description of the manner in which these ends have been attained.

A rational and satisfactory system of charging for current must accomplish certain results, all of which are essential, though not in the same degree. Prominent among these are three considerations, which can not well be separated. The first is to reduce the cost of generation; the second to extend the adoption of electric energy for heating, lighting, power and all the uses for which it is so well adapted, and the third to induce all consumers to increase their consumption, economically to themselves and profitably to the generating company. Such a method must have in view the improvement of the load factor of the entire outfit, the mains as well as the generating mechanism. To do this effectively, it must hold out strong inducements to all consumers to extend the hours of consumption and to multiply the purposes for which current is used. It should not discourage an increased demand for current at any hour of the day; but it should not, on the other hand, induce large demands during those hours when the maximum output for lighting occurs. The general aim must be, as Professor Thomson says, to "smooth out the hills and hollows of the load diagram;" and this can only be done properly by bringing the lower parts of the load curve up to the peak as nearly as possible, instead of lowering the peak itself. Finally, the method must be simple and equitable, to both the company and the consumer. A method that accomplishes all these objects would seem to be as near the ideal as possible. The experience of the past appears to have established a general conviction that the double-rate method, or discounts based upon the time of demand, is best adapted to the main requirements. It has been widely used in different ways, and is simple and logical. To give consumers a discount or low rate during all hours save those in which the peak of the load occurs, and a normal or higher rate during the few hours when the maximum number of lamps will be in use, holds out the strongest inducement to the public to substitute electric energy in place of steam for power, and to employ it for many other purposes.

An increased rate during peak hours does not, in any proper sense, discourage increased demands at that time, and, on the other hand, it does not have any tendency to produce such demands. A reduced rate during the remaining hours, at the lowest figures consistent with the proper interests of the generating company, will act as a powerful inducement to the consumers to use current during those hours.

Cooking, heating and many other of the familiar processes of daily life, only await the time when their performance by a servant so safe and cleanly can be had at a cost which is not prohibitive. The resulting improvement of the load factor, and the increased efficiency of the generating mechanism, will then reduce the cost of production and enable every part of the mechanism to earn its share of the fixed charges. The reduced expenses, and the larger earnings for the extinguishment of the standing charges, will go far toward multiplying the profits of long hours' use, even at largely reduced rates. Moreover, it has been repeatedly demonstrated that such increased demand for long hours, and the resulting improvement in the load factor of the whole outfit, is of itself the means of a great saving in the actual cost of generation.

This matter is too well understood to require any discussion, but as a single example, it may be mentioned that at Brighton, England, it was found that an improvement of three per cent in the load factor had the same effect in reducing the total cost of producing electricity as if the coal bill had been reduced 15 per cent, the charge for coal in this case being $5 per ton. The importance of accomplishing results of this nature has been very generally admitted. The difficulties encountered in the use of a double-rate method have been such, however, as to seriously affect its adoption, although a large number of the leading central station managers regard it as the most complete and simple solution of the problem. The objections urged against it seem to have been due to faults in the means by which the method has been practiced, and not to any defects inherent in the method itself.

Among the devices heretofore proposed, the best was probably that employing two separate meters, or meter dials, one to register all the current used during the hours when a low rate was charged, and the other to register that used at a higher rate. This required the two meters to act alternately. Their operative alternation was effected by a clock at each point of consumption. The expense of installing such apparatus upon a system of even an average extent would be large and would materially increase the fixed charges.

But a more serious objection was found in the great liability of clock gearing to stop, or become wholly unreliable, when used to make and break an electric circuit. While this may be overcome to some extent by using clock gearing of the best manufacture, the evil can not be entirely eradicated, and the large increase in cost, due to the price of high-grade clock movements, would not be compensated by the removal of the objections against the cheaper grades. The frequent inspections necessary, the numerous removals of clocks for repair and regulation, and the winding and setting of a large number of such clocks, would evidently require an increase in the number of employés.

As one of the chief objects of a system of charging should be to enable the company to reduce the cost of generation and lower the rates for current, a method that enlarges the running expenses is, to that extent, hostile to the very purposes for which it is adopted.

It has been proposed to meter a double rate upon a single meter; the speed of the latter being varied by inserting a resistance in an auxiliary circuit at the central station. The plan was to connect all the meter shunts with a separate wire run from the station to the points of consumption, and to vary the voltage on this wire by the insertion of resistance at the central station to regulate the speed of the meters, so that they should register a part only of the current actually used during the hours when a low rate was given. One objection to this method is that the interruption of the auxiliary circuit would cause every meter to stop. A more serious objection, however, is that the necessary drop of voltage upon the separate wire would be likely to seriously impair the accuracy of the results obtained.

A single meter, however, can be used in a manner that removes all objections, and gives accurate registration. By the use of the same form of controller (to be described later, and which is shown in the accompanying cuts), a resistance can be inserted in each meter circuit, at the hour when the low rate is to begin, and maintained therein until the end of the low-rate period. This resistance is graduated to retard the speed of the meter to a degree representing the ratio the low rate bears to the full rate. When inserted the meter will register only a part of the current that is used. By the insertion of this same resistance at each point of consumption, the provision of an auxiliary circuit is avoided, and no inaccuracy can be produced by a drop in the voltage. This plan has the advantage of economy by saving the expense of a second meter at each point of consumption. In some instances this saving may be important, and it is, of course, desirable in all cases. The plan of using two meters, registering alternately, has the merit of simplicity, and is preferred by the average consumer, who can easily understand it, and calculate the amount of his indebtedness.

The single meters can be connected with the same ease and simplicity as the two separate meters.

The chief difficulty in the way of the double-rate method, or, as it is sometimes termed, the differential rate, based upon the time of demand, seems to have been the absence of suitable mechanical appliances by which two meters could be duly controlled, one to meter current at a low rate, and the other at a full rate and in such a manner as to fully protect the company against fraud, secure accuracy, and avoid any material increase in the fixed charges, due to large outlay for apparatus. A description of the apparatus, and the method of controlling it, as now installed upon the system of the company using it, is as follows:

At each point of consumption is placed a small electro-magnetic controller switch, which is shown in Fig. 1. The parts are all enclosed in an aluminum case, four and one-half inches in length and three and one-half inches in width and depth. The enclosed parts consist of two independent electro-magnets, indicated by the numerals 16 and 17 in the diagram Fig. 2, and a pivoted arm 18 carrying an armature and knife contacts, and arranged between the electro-magnets. Upon each side of the pivoted arm are two clips, 22 and 24, which clips are connected by wires 27 and 28 to the terminals of the windings of the electro-magnets 16 and 17, the connection for each clip being made with the magnet lying on the other side of the pivoted arm. The second terminals of the windings of the magnets are connected (in a three-wire system) to the positive service wire 9 and the neutral house wire 7ª. Two clips, 21 and 23, one on each side of the pivoted arm 18, form part of the armature circuits of the two meters 1 and 2.

These meters are shown in the diagram as being of the high-efficiency type of Thomson wattmeter, and they are connected with the controller at each consumer's premises by a wire led from the middle right-hand binding-post, connecting with the shunt or armature circuit, to the right-hand terminal at the top of the controller case. This is the only change made in the normal connections. In Thomson meters of other types, not having the extra binding-post, a small, hard-rubber block is attached to the wooden back-piece between the binding-posts. On this rubber a narrow strip of brass

is mounted, having a small screw at each end, to connect with the terminal of the controller and with one of the armature connections. In meters having shunt circuits, such, for example, as the Edison chemical meters, as well as other types, the manner of connecting the controller is practically the same. In some forms of meters, however, as those provided with a series winding only, a modified construction of the controller is used, by which each meter is wholly disconnected when its period of registration is terminated. The pivoted arm 18 carries two knife contacts, 18 and 20, one of which is connected to earth and the other to the neutral house wire. The knife 20, having an earth connection, is struck into one or the other of the two clips, 22 or 24, which connect with the terminals of the two electro-magnets. One of these controllers is placed at each point of consumption. It will be seen from the diagram in Fig. 2 that, by throwing the pivoted arm 18 to one side, the armature circuit of one meter is

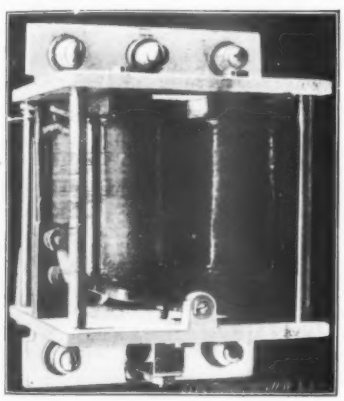

FIG. 1.—MULTIPLE RATE METERING, CONTROLLER WITH CASE REMOVED.

opened by the withdrawal of the upper knife 19 from one of the clips 21 or 23, while the entrance of said knife in the clip on the other side of the pivoted arm completes the armature circuit of the other meter.

The whole system of meters is controlled from the central station, where a small double-throw switch is placed. Two of its clips, 34 and 36, one on each side of the switch-arm 33, have an earth connection. Clip 37, on one side is connected to the positive, and the clip on the other side is connected to the neutral of the system. When the arm of the switch is closed, or thrown into the clips on one side, the circuit will be from the positive, over the switch-arm 33 and clip 36 to earth, then at each consumer's station, by the lower knife 20 and the switch arm 18, through the clip 22, in which the knife 20 is lying, thence through the winding of the magnet 17, on the other side of the switch-arm 18, and then to the neutral house wire and main. The switch-arms at all points on the system are by these means thrown simultaneously into the clips, opposite those in which the knives were resting. At the instant when the lower knife on the controller-arm withdraws from the clip in which it rests, the circuit of the electro-magnet that produces the movement of the arm is opened at the clip. As the same knife strikes into the corresponding clip on the other side of the controller-arm 18, it completes at that point the circuit of the magnet which will be energized when the switch at the central station is thrown into the two clips opposite those in which the switch was previously closed. An indicator is arranged at the central station, to show at any moment at which rate current is being metered. It consists of two dials, having suitable words inscribed, to denote the difference—"Day" on one and "Night" on the other dial answers the purpose. The two dials are illuminated by lamps, placed behind them, and cut in alternately by the operation of the station switch.

Several things are noticeable in the arrangement described: First, the automatic breaking of the circuit of the electro-magnet, by which the throw of the pivoted arm of the controller is produced, and the completion of the circuit of the other electro-magnet, at the opposite clip, by the same movement of the arm.

Every controller upon the system thus cuts itself out automatically by the simple movement of the pivoted arm 18.

Second, the marked simplicity of construction, and arrangement of parts, by which liability to become disordered and tendency to depreciation are reduced to the minimum.

Third, the extremely brief period that current remains on the control circuit, this interval being measured by the time required after one magnet is energized, to enable the knife 20 to draw out of the clip, which forms part of the circuit of that magnet.

Finally—and this feature is the most important of all—the control apparatus throughout the entire system is installed and operated electrically from a single point (the central station) without the trouble and expense of providing a wire, or wires, for the control circuit. This is a feature of no small advantage in any case, but where the mains are not laid in subways, and where, as in the Edison system, the wires are piped, and buried beneath heavy block pavements or asphaltum, the labor and cost of laying a control circuit would be very great. Upon the lines of the company, where the apparatus is installed, the mains are in conduits in which two disused pressure wires were found, each No. 16, Brown & Sharpe gauge, and partly as a matter of convenience one of these wires was used for the circuit, controlling a number of the earlier installations. With others, two circuit wires were connected, the object being to ascertain if there were advantages in one arrangement, as compared with the other. Repeated trials and continuous use, extending over a period of nearly six months, have shown that the accuracy of control and certainty of operation were the same.

(To be concluded.)

Central Station Engineering.

[From the American Machinist.]

A correspondent at Springfield, Ohio, sends us an account of the mutations through which a street railway plant in his state was put, in the efforts of the engineers (?) to improve it.

The first improvement was the in-

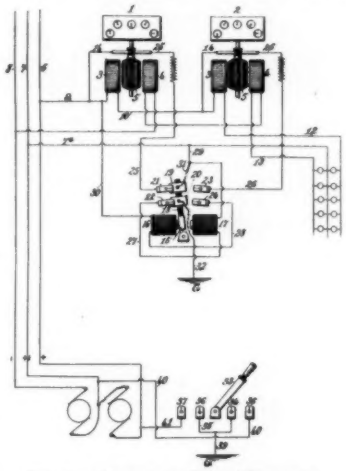

FIG. 2.—MULTIPLE RATE METERING.

stallation of a fan and system of distributing pipes to blow cold air on the bearings and blow the friction of the bearings away by dissipating the heat after its generation. Following this the station of four generators was rearranged and driven by a single engine, although the day-load was not three-eighths of the running load. All this was done as an improvement on a plant, which was

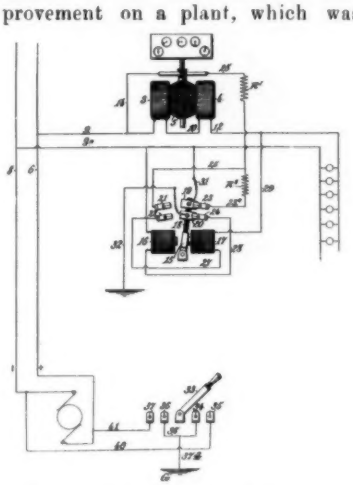

FIG. 3.—MULTIPLE RATE METERING.

correctly arranged at the start, with well designed dynamos and separate engines, which were operated as required under nearly full load.

The Lincoln, Neb., Street Railway Company, recently purchased by Mr. A. L. Scudder, of New York city, for $65.000, will be changed to the Lincoln Traction Company, with a capital stock of $1,065,000.

GENERAL NOTES.

"Stewart's Telegraph Code," by Charles A. Stewart, M. A., is an ingenious and practical scheme by means of which any number from one to one million can be expressed by a single word of not more than 10 letters. The code is printed in pamphlet form, and will be sent postage free on receipt of the price, 25 cents, by the Electrical Review Publishing Company, Times Building, New York city.

The Brooklyn City, N. Y., & Newtown Street Railway Company has equipped two cars with the Dubleook bicyc e hanger for carrying bicycles over the dash, rear and front. The two cars equipped are running on the Franklin avenue line, and the railroad officials say that if they find that this carrying of bicycles is a convenience to the cyclists and they will patronize it, all the cars of the line will be equipped in the Spring.

Announcement was made last week in the ELECTRICAL REVIEW of the change in name of the Partrick & Carter Company, of Philadelphia, to Partrick, Carter & Wilkins. This is one of the oldest and most reliable electrical supply houses in the United States. The ELECTRICAL REVIEW is pleased to note the appearance of Mr. Wilkins's name in the firm title, and wishes him a continuance of the success he has so long merited and enjoyed.

Worthington C. Ford, Chief of the Bureau of Statistics at Washington, discusses in the *North American Review* for January the conditions and influences which insure the "Commercial Superiority of the United States." Mr. Ford presents interestingly the various phases of economic progress attendant upon the growth of the country, giving prominence to the fact that to-day the United States is the only great industrial power which produces cereal food sufficient to maintain its labor and sell a surplus to foreigners.

J. F. Hull, superintendent of the Polk County Telephone Line, and Miss Flora Linke, both of Humansville, Mo., were married on December 30 over the telephone wire. The groom was at Bolivar, while the bride was at Humansville. A minister was at either end of the wire with the required number of witnesses. All participating were acquainted with one another, and recognized the various voices. The witnesses are, therefore, prepared to swear, if ever a question is raised, that they know of their own knowledge that the ceremony was performed.

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SPECIAL NOTICE TO ADVERTISERS.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.

NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

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Our subscribers will receive with this issue of the ELECTRICAL REVIEW a classified index to Volume XXXI. The index is printed in the old size to harmonize with the issues of the paper to which it refers.

The city authorities of Jersey City, N. J., are endeavoring to regulate the storage and use of calcium carbide and acetylene by ordinance. This is a step toward the final result of prohibiting the storage of these dangerous compounds except under the provisions of law governing other explosives.

THREE FACTS.

1. The ELECTRICAL REVIEW is the most widely read and quoted electrical journal published in the world.

2. The ELECTRICAL REVIEW has printed and sold more copies of a single issue than any electrical journal published in America.

3. The ELECTRICAL REVIEW is to-day paid for yearly by more persons who read it than any electrical journal in America.

We ask our readers and advertisers to carefully consider these statements.

There has never been any deceptive padding in this journal; nor have we devoted our energies to flooding the country with misleading statements, but we feel that at the opening of this promising new year we are justified in making these statements.

THE RUBBER-COVERED WIRE POOL NOT YET ORGANIZED.

On Friday of last week, a number of the manufacturers of insulated wire attended a meeting on the invitation of Attorney Jackson, at 115 Broadway, New York city. Mr. Jackson is interested in the movement to organize these manufacturers into a pool, or into one large company. Among the gentlemen seen to enter the office were Messrs. Roebling, Phillips, Habirshaw, Candee, Reed and Gallaher, and their discussion of the matter is said to have been quite comprehensive and animated. It is understood, however, that no basis of getting together could be arranged, and the meeting dispersed without accomplishing anything.

The electrical progress and development of Niagara Falls and Buffalo is noted in an interesting article in this issue of the ELECTRICAL REVIEW. The limit of the use of electric current in the territory mentioned is as yet unknown. The demand for current for industrial purposes has always been, and continues to be, in excess of the supply. There is a wonderful future ahead for Buffalo, for which electricity is largely, if not chiefly, responsible.

The advance in vacuum-tube lighting, as applied particularly to photography, recorded by Mr. Nikola Tesla in the ELECTRICAL REVIEW last week, attracted, as it deserved, very wide attention. We are pleased to state further, on information received from Mr. Tesla, that additional progress has since been made, and that he is now enabled to photograph instantaneously with equally advantageous results.

Our old friend, Meekin the lazy inventor, has had a pretty hard time lately. Under the cheering influence of New Year greetings and prospects, however, he may be expected to occasionally unbosom himself for the entertainment of our readers, and always with the assured sweet sympathy of the never-failing (or, we should say, ever-failing) class of inventors who succeed not though fertile and ingenious.

Now is the season when advocates of municipal ownership of electric lighting plants are most likely to be heard from. A number of enthusiasts have recently voiced their views, but all ignore the question of politics and the financial advantages a municipality has over a private corporation. Put the city and a private company on the same footing with the same privileges and the same burdens and the political factor will ruin the city plant every time.

The ELECTRICAL REVIEW is pleased to commend several of Mayor Van Wyck's appointments. The selection of Mr. John W. Keller, the well known newspaper man, as president of the Board of Charities is a very proper one. No better selection could have been made. The Mayor also made two selections from the Board of Electrical Control—Mr. Thomas L. Hamilton to be Police Commissioner, and Col. H. S. Kearney to be Commissioner of Lighting—both capable, intelligent men. Another selection that deserves high commendation is that of Mr. William Walton, of the borough of Brooklyn, who will be Deputy Commissioner of Lighting in that borough. Mr. Walton is a well informed newspaper man, and has made a special study of electrical work.

WALL STREET AND THE ELECTRICAL STOCK MARKET.

The new year in the stock market opened with a weak tendency which continued a few days on the selling of stocks prompted by the disappointment of their holders, who believed that the expected January boom would begin on the first business day of the month. Prices recovered, however, and on Wednesday began a steady upward movement on increasing activity. The market has been largely professional, and manipulation by certain well known leaders has been its most salient feature. Toward the close of the week, however, commission-house buying increased in volume and there were evidences that the public was inclined to take more interest in speculative matters. The bond market has ruled very active and strong, notably in the speculative issues, and several new high-record prices were made.

The situation of the local traction stocks has been of exceeding interest to Wall street. The pool which has been operating in Manhattan succeeded in advancing the price of the stock to a higher figure than obtained at any time in 1897. Great importance attaches to the persistently circulated rumors that the Elevated has awarded the contracts for equipping the property with electricity. One of the directors told me recently:

"While I can not say positively that the contracts have yet been placed, I know that George Gould is very anxious to take immediate action in the matter. It would not surprise me if he, as president of the company, signed the contracts and asked the directors at their next meeting to ratify them, much as he did in the Pintsch light matter. The change of motive power will mean a saving of about $1,000,000 to Manhattan, and the interest on the funds that must be raised to effect it will amount to about $250,000, which would mean a saving per annum of $750,000 to the company." That portion of the Mayor's message relating to the local rapid transit situation indicates that important changes for the better are in store for Manhattan, including not only the loop at Battery and the West street extension, but probably also a further extension on the west side of the city with a northern loop connecting the various lines, and perhaps even a crosstown elevated not far from Twenty-third street. All this was earnestly fought for by the late Jay Gould.

Metropolitan Street Railway also advanced after the early slump on buying of the nature called "good" in Wall street. A semi-official statement was given out by the management to the effect that business on the Madison Avenue line had increased

so remarkably under electrical equipment that it was expected to pay the interest on the $12,500,000 bonds from the increase in the Madison Avenue earnings alone.

Brooklyn Rapid Transit was exceedingly active and sold at the highest figures on record. Ex-Governor Flower and other inside interests have steadily claimed that their company is the Metropolitan Street Railway of Brooklyn, and since the favorable decision in the loop case they have been advising their friends to buy the stock and the bonds. Further action to defeat the completion of the loop at the Bridge terminal is not regarded with apprehension by the management and developments in regard to Brooklyn Elevated control are expected shortly.

General Electric Company was advanced on Friday by the circulation of the report that the company had captured the contract for equipping the Manhattan system with electricity. This report, however, is officially denied.

Another report which obtained some credence was that the Westinghouse company occupy a more favorable position, as it is remembered that some years ago Manhattan officials made a careful examination of the plans of electric power on elevated lines made by the Westinghouse company. Apropos of the recent reported troubles between the Westinghouse and General Electric, the matter is said by an authority to have been substantially as follows: According to the terms of the agreement, General Electric was to receive 65 per cent and Westinghouse 35 per cent of the business. In case either company did a greater percentage than the amount stipulated, it agreed to pay over to the other a certain percentage of the revenues derived therefrom. The General Electric Company ran ahead of its proportion, and the Westinghouse brought the matter to the attention of the directors of the two companies. Several conferences were held and an agreement reached satisfactory to both. Relations are now harmonious.

After a decline, caused by the circulation of a report that Russell Sage was dangerously ill, Western Union rallied and advanced to a price above the previous high figure. This is indirect confirmation of the statement made in this column two weeks ago that certain prominent interests had decided to put up the stock. Earnings from test-office receipts show a continued increase over last year, and indeed there has been an increase almost every week for a number of months. An important decision in its favor is said to have been received by the company in Mexico recently, by which it retains control of nearly the entire Mexican business.

Transactions in electrical stocks during the week on the Philadelphia Exchange were as follows: Electric Storage Battery, common, gained a point, closing at 27; the preferred was bid 29½, offered at 30; Welsbach Light, 41 bid, offered at 42. Pennsylvania Heat, Light and Power, on moderately heavy transactions, advanced from 18¼ to 19¾. On the Boston Exchange, Bell Telephone, on light dealings, advanced 2½ points; Erie Telephone gained 1, while General Electric, common, on fairly good buying, rose 2 points. The preferred stock also gained a point. New England Telephone, from an opening of 127, closed the week at 129 bid, offered at 130.

An additional issue of $400,000 five per cent first mortgage bonds has been made by the Chicago Edison Company, bringing the total amount now outstanding to $2,975,000.

The Madison Gas and Electric Light Company, of Madison, Wis., has declared its regular semi-annual dividend of two per cent, payable January 20. RAY.

Wall Street, January 8, 1898.

The Montauk Multiphase Cable Company.

The Montauk Cable Company, of 100 Broadway, New York city, are sending out a very valuable contractors' handbook for the benefit of electrical engineers and contractors. The book has been very carefully compiled and gives the specific causes of fires from insurance statistics covering over 30 years. It is especially useful as a reference book to the engineer, having all the causes of fire in any class of building, together with the classifications and number of causes of fire in all lines of business and the percentage for each cause.

The multiphase cable practically opens a new field for electrical engineers, that has never been touched upon before. The introducing of a fire and burglar cable in many of the business buildings where some such arrangement is absolutely necessary, will provide the engineer with an opportunity of securing business in a territory that up to the present time has experienced absolutely no competition, thereby giving a wide range for operations.

Although the cable is acted upon as a whole, yet different causes produce different results: Heat or flame brought to bear will give the fire alarm, and should the cable be severed or cut by any sharp instrument, an entirely different alarm will be given —that is, the burglar alarm.

It is possible to put several different sizes of cable in a building. In that part of the building where only a certain alarm is necessary, a smaller cable can be used, thereby avoiding the unnecessary expense which a continuously large cable would entail.

PERSONAL.

Professor Lenard, of Heidelberg, who discovered the Lenard rays, has received from the French Academy of Sciences its prize of 10,000 francs.

Mr. Philip Lehman, of Lehman Brothers, bankers, New York, has been elected a director, and Mr. Herbert Lloyd second vice-president of the Electric Storage Battery Company of Philadelphia, the latter in place of Mr. W. W. Griscom, deceased.

Mr. Charles S. Pease, formerly general superintendent of the Interior Conduit and Insulation Company, of this city, has assumed charge of the Stirling (water tube) Boiler Company's interests at New York, vice Mr. F. A. Scheffler, who has resigned to accept the general superintendency of the Sprague Electric Company.

LATE NEWS.

Alfred F. Moore, the well known wire manufacturer, of 200 and 202 North Third street, Philadelphia, is sending out a large and handsome calendar, of a size and form valuable for business offices.

President Rice, of the Electric Storage Battery Company, says that orders for storage batteries during the year 1897 were more than double those of 1896. The company has just closed a contract with the Chicago Edison Company for storage batteries amounting to $125,000. This plant, when completed, will be the largest storage battery plant of its kind in the world. The company has also contracted with the Electric Vehicle Company, of New York, to equip 100 carriages.

National Electric Light Association.

The ELECTRICAL REVIEW has received from secretary George F. Porter a handsomely bound volume of the proceedings of the twentieth convention of the National Electric Light Association held at Niagara Falls, N. Y., June 8, 9 and 10, 1897. The volume is a credit to the association and to Secretary Porter.

Removal of Standard Air-Brake Company Offices.

The offices of the Standard Air-Brake Company have been removed from 100 Broadway to 168 Broadway, New York city, and the general management of the company passes under the control of Mr. Jos. R. Ellicut, a gentleman well known in the electric railway field.

ELECTRICITY ON NEW YORK ELEVATED ROADS.

MR. GOULD STATES THAT ELECTRIC EQUIPMENT WILL BE INSTALLED AT ONCE.

President George Gould, of the Manhattan Railway Company, of New York city, on Monday of this week, issued the following authorized statement:

"We have decided to introduce electricity on the elevated system, and we will now proceed to effect a general installation with as little delay as possible. I wish it understood that we purpose to work energetically along the lines indicated in Mayor Van Wyck's message and leave nothing undone to adapt our accommodations in the fullest possible degree to the requirements and comfort of the public."

It is understood that among the electrical companies interested are the General Electric, Westinghouse, Walker and Sprague. There was a rumor that this important contract, amounting to from $7,000,000 to $8,000,000, would be divided among these companies, but it is more likely that it will be given to one.

Death of F. B. Phelps.

Frank Bain Phelps, who for three years past had been the financial editor of the ELECTRICAL REVIEW over the name of "Bain," died of heart failure in New York city on January 7. Mr. Phelps had been in poor health for two years, but his death came so suddenly that it greatly shocked his many friends in Wall street, where he was well known and highly esteemed. He was 32 years old, and leaves a wife to whom he was married about two years ago. Mr. Phelps was one of the keenest and best posted financial writers in New York city, and was connected with a number of prominent daily and weekly newspapers. The sympathy of the ELECTRICAL REVIEW is extended to his widow.

The promoters of the Hamilton, Ont., Chedoke & Ancaster Electric Railway are making a vigorous effort to dispose of the balance of the stock, and hope to commence operations at an early date.

PUBLIC CONTROL, OWNERSHIP OR OPERATION OF MUNICIPAL FRANCHISES.*

WITH SPECIAL REFERENCES TO ELECTRIC LIGHTING.†

BY R. R. BOWKER.

A modern municipality is at once a small state or body politic, and a great corporation or co-operative business. In emphasizing its functions as a business, its limitations as a government must be not less emphasized. If that government is best which governs least, the public should not undertake what private enterprise can do as well. The "government of the people, by the people and for the people" of Lincoln, truest of democrats, meant a democratic republic, not a populistic socialism. If the trend of the municipalization of industries makes toward socialism in the state, there is reason for caution.

It is recognized by most thinkers that the social increment belongs to the people. The public, and not private interests, should benefit from the increased values directly caused by the growth of a great city. This does not involve socialism or the municipalization of industries. It does demand that franchises should not go out of the people's hands without limits as to time, safeguards as to price and adequate power of control.

DEVELOPMENT OF MUNICIPAL INDUSTRIES.

The private or toll road, the well or spring, the private cistern, the tallow dip or oil lamp, develop in a modern city into great public needs, which can be handled only in an organized way. Among the facilities answering to such needs are streets, sewers, the supply of pure water for drinking and for steam, and of salt or other water for flushing and for fire use, lighting by gas or electricity, telegraph and telephone communication, the supply of power through conduits, street transportation—surface, elevated or underground—pneumatic tubes and postal, messenger or parcels service.

Good roads, it is conceded, must be provided by the commonwealth, as also sewerage; water supply is usually, though not always, considered a municipal function; lighting, communication and transportation are on debatable ground; there are few in this country who approve public bakeries or storehouses, although bread is a necessity of life. Somewhere within this range is the point where democracy becomes socialism. It is important to limit the function of the municipality at that point, and not to be misled by the phrase that "a city is a business corporation."

There is no longer any question of the legal right of a municipality in these days to enter almost any field of public supply. Practice has made abundant precedent, and repeated decisions of the courts, culminating in the rapid transit decision of the New York Court of Appeals, have settled beyond doubt the legal right of municipalities to invest in and operate what may be called municipal industries. Indeed, so far has practice gone—as in actual cases where electric lighting has been supplied to private consumers below cost, at the expense of taxpayers in general—that it is difficult to apply the limiting decision of the United States Supreme Court in the Topeka case, that "there can be no lawful tax which is not laid for public purposes." The real limits of municipal activity must be found in an alert and wholesome public opinion, which will prevent steps that lead by easy reaches into socialistic enterprises pure and simple.

NATURE OF MUNICIPAL FRANCHISES.

A municipal franchise is generally understood to mean a freedom or privilege granted by a municipality giving to companies or other private persons the use of public property or facilities, as of the streets, for the supply of conveniences or commodities to its citizens. The phrase has come to mean indeed an industry for which a franchise would be needed, and has been applied even when such an industry is operated by the municipality. Too often a franchise has been a free g ft to private persons; but it is now conceded that such privileges should involve adequate return to the public. This may be made either by reduction in price, giving advantages directly to those citizens who are consumers, or through payment to the municipality of taxes, license fees, royalties on output or gross returns, or share of surplus profits, which last is perhaps the best way, because it does not increase or tend to keep up price, but does offer to a supply company an inducement both to enterprise and economy. It does not matter to a gas supply company, for instance, whether the price to consumers is $1.25, out of which 25 cents is paid to the city, or is $1 to consumers direct. On the contrary, it does matter to taxpayers, when a municipal corporation operates an industry, whether the price to consumers is made at or below cost. While in case of profit the citizens generally reap the benefit through the municipality, in the case of loss they have to pay their quota, through taxes, for the benefit of those citizens who as consumers have had their supply at less than cost. In private companies this result of miscalculation or bad management falls only on those who as shareholders have deliberately taken risk.

Franchises to supply public needs are often generalized as monopolies, but a distinction should be drawn. The postal service of the government is a monopoly and an artificial monopoly, because the law makes competition a penal offense. At the start the well and the private cistern may exist alongside the general water supply and sewerage system, but as a town grows into a city the board of health must intervene, and water and sewerage become practically monopolies. Railroads, telegraph and telephone lines are not in themselves monopolies (except as the telephone system is founded on exclusive patents), for it is chiefly because of the public value of an extended and centralized system that new or lesser competitors have little chance. Lighting is not a monopoly because gas and electricity have oil, as well as each other, for competitors; and an electric company must also compete with private electric plants—which prevents extortionate prices by what economists call substitution use. It is only when the use of the streets is given to one company or private person as against all others, that there exists a real monopoly in such service.

DISTINCTIONS AMONG INDUSTRIES.

The real key to what is usually called a municipal industry is in this fact: As the whole arterial system of the human body radiates from one central supply station, the heart, so the supply of water, gas, electricity, telephone communications, etc., in a great city, to be constructed and operated at best advantage and at least cost, must radiate from one or more central sources of supply, using the streets as arteries. Here competition involves duplication of investment, increased waste, multiplication of operating expenses, in short, economic loss instead of gain. A unified street railway system, with its advantages of transfer, has the same economic advantage over independent lines. The inevitable trend in all these cases is, therefore, toward consolidation instead of competition. It is often cheaper to throw parallel systems out of use than to continue the waste of double operating. Competition, in such cases, does not act to reduce price, except by the cut-throat competition of rate-cutting, which involves a final loss instead of a public gain. If three gas mains exist where but one is needed, there is three times the investment cost and three times the operating expenses; costs, and, therefore, prices, are higher; and in the end, usually one system survives, and the other two are dead loss. The limitation of price, therefore, must be brought about, in private operation, not from competition, but by the application of sound business principles on the part of those controlling the industries, or by the exercise of the power of municipal regulation in connection with the use of the public streets.

A distinction is to be made between the distribution of natural products and the manufacture of artificial products. Water supply is the distribution of a natural product. There is no manufacture, unless pumping and filtration be so considered. The production of gas or electricity is, on the contrary, a most complicated process of manufacture, especially requiring skilled labor and directive ability. Co-operative production has failed more than once where co-operative distribution has succeeded; and here, perhaps, should be one line of division between municipal and private enterprise.

Another distinction is to be drawn between free and commercial service. The streets are free. Sewerage is free. Water supply is partly free and partly paid for in water "rates" or taxes, especially by large consumers, directly according to metered consumption. Street lighting is free, commercial lighting is individually paid for; but each costs less to produce or distribute when combined with the other. Possibly the line of municipalization should be drawn at supplies which are wholly or chiefly free.

A line is sometimes drawn at necessaries of life. Air is a first necessary of life, and the limitation by law of the height of buildings may be required to prevent dangerous fouling of air in the streets and lower stories. Water is a necessary of life, and is supplied usually, though not always, by the municipality. Food is always a necessary of life; heat and clothing are necessaries in most climates. Nevertheless, these are not considered, except by extreme socialists, as properly included under municipal functions. Lighting is a convenience—almost, but not quite, a necessary of life. Transportation is a convenience, but scarcely a necessity. It does not seem that this line of division has real bearing.

Clear thinking is most necessary in distinguishing between public control, public ownership and public operation. Public control involves inspection and regulation, but not necessarily ownership or operation. Public ownership may involve the ownership of the distributing system only, for which the public highways must be used, or of the manufacturing plant also, a distinction most important, though seldom emphasized. Public operation means the actual administration, as a productive business, of both manufacture and distribution. It is important to keep these distinctions in mind in considering the status in respect to public services in the great cities of the world.

(To be continued.)

The New York City Gas Commission met on December 29 to open bids for lighting the streets and public parks of the present city for the coming year. Seven bids were received from electric light companies, and eight from gas and naphtha concerns for the lighting of various sections of the city. There was little or no competition. The bids will have to be tabulated before the results can be announced.

*From *Municipal Affairs.*

†This paper is written from the point of view of the economist and citizen, but with the data and experience gained as the executive of the New York Edison Company. To my mind, this should not involve opposition of interests: as he most serves his party who best serves his country, so he most serves the interest of a public service company who best serves the public. I mention the relationship, however, to forewarn readers of any unintentional bias. It is difficult for any, outside the business cited, in an academic discussion, to obtain real bases of comparison.

WESTERN NEWS NOTES.

Mr. Kempster B. Miller, of the Western Telephone Construction Company, is enjoying a short vacation from his duties, taking advantage of the holidays to make a little pleasure trip in company with Mrs. Miller.

Those who have had the good fortune to become closely acquainted with Mr. A. F. Nagle, the well known consulting engineer of Chicago, will be pleased to hear that he has been retained by the Lane & Bodley Co., Cincinnati, as consulting engineer in the erection of the new waterworks in that city. The contract is one of the largest, if not the largest, ever let in the country, and it reflects very favorably on Mr. Nagle to have been chosen for such an important position. Besides the pumping machinery there will be a complete electric lighting plant, electric traveling cranes and electric elevators.

A curious accident, directly traceable to the use of an incandescent lamp, occurred last week in Chicago at the Independent Brewery, where, through the explosion of alcoholic vapors in a gigantic beer tank, a cask varnisher was blown through the manhole and instantly killed, while two helpers of his were stunned and terribly burned. The varnisher named Winkofsky had taken the contract to varnish the interiors of five iron tanks of 1,000 barrels capacity each, and, with his men, had been working all day on the first one. They entered through a small manhole near the bottom, and an incandescent electric light was passed in to them to work by. At three o'clock the men ran out of varnish and Winkofsky called to his helper to hand him a can. This the man did. He saw Winkofsky, who was holding the lamp, stumble, and the next instant the bulb crashed against the side of the tank and an explosion followed that brought every man in the brewery running to the spot.

The natural outcome of the present situation in the electric lighting industry in Chicago will be a consolidation of the several companies in the city, and it is believed that initiatory steps in that direction are now being taken. With the exception of the Cosmopolitan company, which is getting ready to enter the field this coming year, every lighting company in Chicago is under the control of either the Edison company or Jno. R. Walsh. It is understood to be the purpose of the owners to bring the several interests under one management and thereby avoid the unnecessary expense of separate operation. It is also possible that the electric light business of the Calumet Gas Company in South Chicago may be included in the combination. The capitalization of the companies which may thus be affected is as follows:

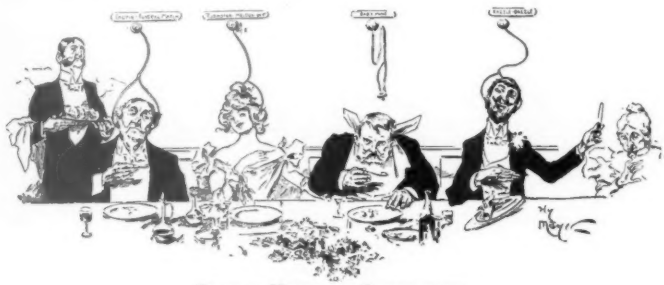
	Stock.	Bonds.	Total.
Calumet Gas Company	$1,000,000	$800,000	$1,800,000
Hyde Park Electric Light and Power Co.	267,500	100,000	367,500
Hyde Park Thomson-Houston Light Co...	125,000	50,000	175,000
Englewood Electric Light Company.....	176,100	.....	176,100
Total.....	$1,568,600	$950,000	$2,518,600

In order that the Edison-Walsh interests, which are nominally distinct, may both operate under the franchise, some form of combination will be necessary and the absorption of the plants of the southern district by the Edison company may ultimately follow the consolidation of the four companies. The Edison property will be equally benefited by the purchase of the ordinance, since the franchises under which it is operating at present expire in about 15 years.

Chicago, Jan. 1, 1898. C. E. K.

TELEPHONIC.

Ringing up the central.—*Judge.*



DINNER MUSIC BY PHONOGRAPH.

A way in which the musically inclined can be accommodated without causing annoyance to those who are of a different turn of mind.—*Judge.*

The Crow and the Pitcher.

The late Mr. Æsop, who used to write small, pertinent tracts with large, aggressive morals, for the edification alike of the ancient Greeks and the modern schoolboys, is responsible for this anecdote.

A crow, who had been haranguing a ward caucus all the evening, had contracted a large, importunate thirst.

As he was looking about to find some means of relieving himself of this same thirst, he discovered a pitcher, which contained water.

But the pitcher was very large, and the quantity of water it contained was small, and reposed at the very bottom.

For anatomical reasons the crow could not dip his bill into the water and drink from the pitcher as it was.

Nor was there any use in trying to pour out the water, for the crow could not lift the pitcher.

Besides, he had no cup.

But he was a wise crow, and also persistent, and he immediately resolved himself into a committee of the whole on ways and means and hatched out a solution of the problem.

He picked a pebble from many lying around and dropped it into the pitcher.

He kept on dropping pebble after pebble into the pitcher, until the water approached near enough to the top for him to drink, and he slaked his thirst with ease.

Moral: It is continuous advertising that pays.

If the crow had stopped after one insertion, merely because he could not see any results, he would be thirsty yet.—*Bates' Criticisms.*

HUMOROUS ELECTRICITY.

WHAT OUR FRIENDS OF THE CARTOON FIELD FIND TO PICTURE.

The ELECTRICAL REVIEW has arranged with the publisher of *Judge* to present in its columns the copyrighted cartoons relating to the electrical field. *Judge* is the most popular and most widely known comic weekly in the world. Its artistic work, although comic, is of a high order of merit. The privilege to reproduce these pictures is one granted to no other publication in the United States, and as

"A little nonsense now and then
Is relished by the wisest men,"

the REVIEW is confident this feature will be enjoyed and appreciated by its readers.

We present on this page a trio of illustrations, showing the idea of the artists as related to the telephone, the phonograph and the kinetoscope.

KINETOSCOPE REALISM.

FARMER GREENACRE.—"I gol! this pictur' of the beach at Ocean Grove is so dern natteral you kin almost feel yer feet gittin' wet."—*Judge.*

Mr. S. Dana Greene To Address the New York Electrical Society.

The 184th meeting of the New York Electrical Society will be held at the College of the City of New York, Twenty-third street and Lexington avenue, on Wednesday, January 12, at 8 P. M.

Mr. S. Dana Greene will read a paper on "The Relations Between the Customer, the Consulting Engineer and the Electric Manufacturer."

It will be the aim of Mr. Greene, in this paper, to assist in bringing about that better understanding between these departments of the industry on which much of its welfare and prosperity depends.

A Pneumatic Oil-Feeding and Saving System.

The Q & C Company, of Chicago, are the manufacturers of the pneumatic oil-feeding and saving system illustrated and described herewith. The particular advantages claimed for this system are economy and efficiency. Considerable saving in labor, oil, fuel, machinery, life and accident are made, beside the very desirable fact that perfect cleanliness is attained.

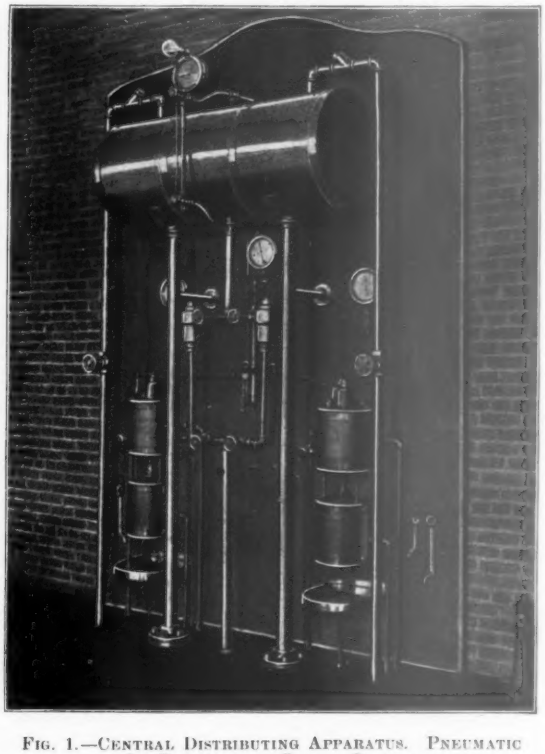


FIG. 1.—CENTRAL DISTRIBUTING APPARATUS. PNEUMATIC OIL-FEEDING AND SAVING SYSTEM.

The pneumatic oil system here described is not dependent in any manner upon surrounding conditions, such as the height of a building or the rolling and tossing of a ship. It may be operated from above, below or on a level with the machinery. It is compact in its essential parts and can be controlled by one man from a central point. The manufacturers state that the system will never fail to give a uniform steady supply of oil to the machinery under all kinds of service, and that oil may be fed slow on one bearing and fast on another immediately adjoining it. It is also stated that this system permits the flooding of all bearings on a plant with oil, if required, without losing any more than would have been lost under ordinary conditions of feeding.

In Fig. 1 are shown the fountain-head, air compressors, pressure filters, gauges, piping, valves, etc., which make up what is called the "fountain-head" or central point of distribution. The fountain-head is of from 40 to 80 gallons capacity, and is erected on two pipe standards about eight feet above the engine-room floor. The line of pipe to the left, containing a check valve at the top and a globe valve in the center, is the oil-supply line running from the main oil-receiving tank in the basement. The line of pipe to the right, similarly equipped with valves, is the air-supply line running through a reducing valve to the main air receiver in the basement. Between each of these pipes and the adjoining pipe standard an upright air compressor is erected, and each of these is connected to the main air receiver. These compressors may be worked independently or together, as may be desired. Below the fountain-head are placed two pressure filters, which work independently or together. The fountain-head itself is equipped with its own pressure gauge, gauge glass, cocks, etc., besides having a small independent line of pipe running to and over the large filter in the basement. In this pipe is placed a pop or relief valve, which works automatically, to relieve the fountain-head when in forcing oil into it from the main receiver, the pressure becomes greater than the maximum used for feeding purposes.

Fig. 2 shows the elevation of a double system, installed in the Edgewater Electric Railway Power Station at Chicago. The drawing shows the arrangement in the basement of the main engine oil receiver, main air receiver, main cylinder oil receiver, and the main filter.

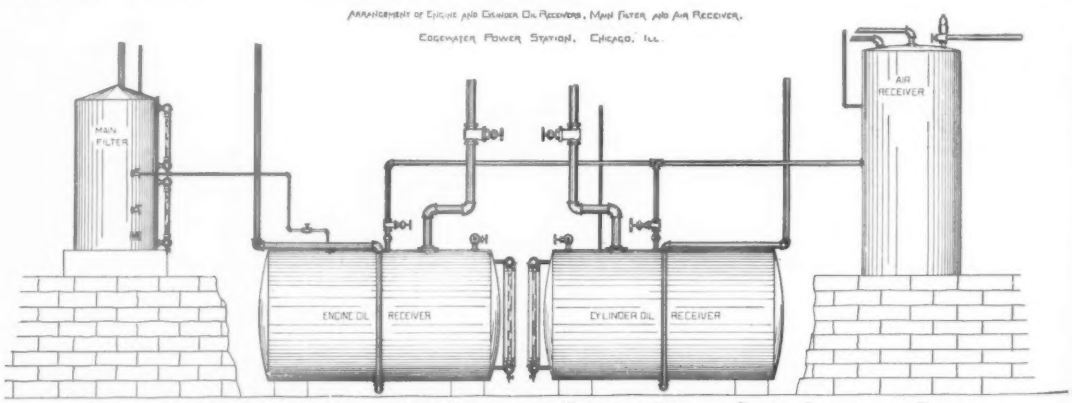

ARRANGEMENT OF ENGINE AND CYLINDER OIL RECEIVERS, MAIN FILTER AND AIR RECEIVER.
EDGEWATER POWER STATION, CHICAGO, ILL.
MAIN FILTER
AIR RECEIVER
ENGINE OIL RECEIVER
CYLINDER OIL RECEIVER

FIG. 2.—DOUBLE OILING SYSTEM IN THE EDGEWATER ELECTRIC RAILWAY POWER STATION, IN CHICAGO.

From the air receiver to the oil receiver, which forces the oil out of the latter through a line of pipe in the bottom, which passes up through the engine-room floor and connects with an oil-supply line to the fountain-head. When the latter is filled with oil, as indicated by the gauge glass on the outside, the valve in the oil-supply line is closed, and the three-way cock is turned back to its original position, thus shutting off the flow of air from the air receiver to the oil receiver and opening communication between the oil receiver and the main filter. At the same time a check valve and port are brought into play, discharging over the top of the filter, which prevents the air in the main oil receiver from rushing into the main filter and permits it to escape to the atmosphere before the filter will begin discharging its oil into the receiver. With the fountain-head filled with oil enough to run the engine for the next 10 or 12 hours, and wishing to distribute it to the cups on the engines, the valve in the air supply pipe of the fountain-head is opened. Instead of using the full maximum pressure of 60 pounds carried on the main air receiver, it is drawn down to 20 or 25 pounds by means of a reducing valve. This amount of pressure is usually sufficient for feeding purposes. In many cases even less pressure is used, the height and distance to which the oil must be forced governing the matter.

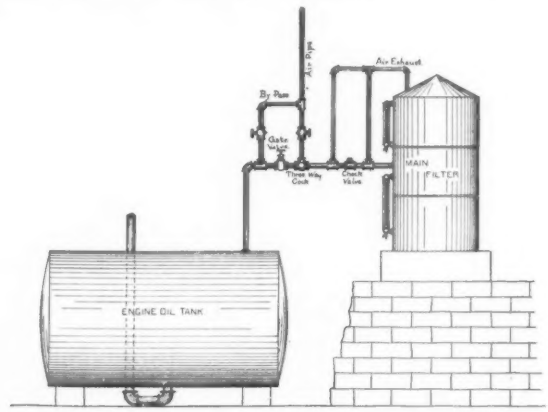


FIG. 3.—MAIN OIL RECEIVER AND AUXILIARY APPARATUS.

In Fig. 3 is shown the main oil receiver, with its auxiliary apparatus. The method of operating the system is partly illustrated by this diagram. After the air compressors have been started and an air pressure of 60 pounds on the main air receiver has been obtained, the globe valve in the supply pipe of the fountain-head is opened, and the three-way cock in the line of pipe between the main filter and the main oil receiver is turned. This shuts off the filter, and at the same time allows a flow of air

ROENTGEN-RAY NOTES.

BY WILLIAM ROLLINS.

XIV—A REASON WHY LENARD'S X RAYS WERE FEEBLE.

I have never seen Lenard's original papers, my knowledge of his work being confined to what is given in Thomson and Anthony's work on X rays. They give a plate showing his tubes. The anode is behind the cathode, encircling its stem, the aluminum window being connected with it. For one of my experiments I employed this ring cathode, using Roentgen's reflecting platinum in place of the aluminum window. Soon after the generator was started the stress of the current strained the medium between the cathode stem and the annular anode to the point of rupture. The cathode stem then began to vibrate rapidly, the range of movement being as great as the annular anode permitted. The generation of Roentgen light was at all times feeble, because only a little of the force of the current was expended in sending the cathode discharge forward to the target.

XV—DOES THE CATHODE STREAM GO FORWARD IN A HIGH VACUUM?

In paragraph 57 of the work mentioned, the statement is made that Crookes found at a low vacuum the cathode discharge taking place in the direction of the anode, even curving from the concave surface to reach an anode behind. At a high vacuum this did not take place, the stream going straight forward, without regard to the position of the anode in lines perpendicular to the surface. In previous notes I have spoken of the form of the cathode stream and its relation to the surface. In this one, only the direction of the stream in regard to the anode will be mentioned. For one of my experiments I made a tube like the one described in Note 14, only the ring anode was so large that the strength of the medium between the encircling anode and the stem of the cathode was nearly equal to that between the concave surface of the cathode and the usual reflecting platinum target. This tube is shown in Fig. 1. When the encircling ring was the anode, no discharge went forward from the concave side of the cathode to the target; and, so far as the production of Roentgen light was concerned, that bulb might have been removed without effecting it, for the whole interior was dark, while the bulb containing the ring anode was full of Roentgen light, though the definition was necessarily imperfect. Evidently, therefore, at the degree of vacuum used in producing Roentgen light, the position of the anode in relation to the cathode may be of importance. I do not, however, attempt to criticise Crookes's statement—simply relating what I saw.

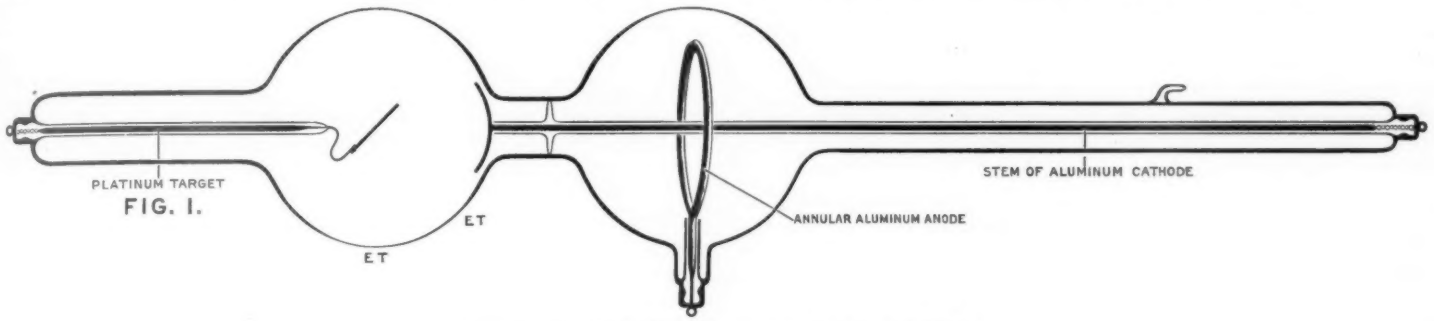


FIG. 1.

FIG. 1.—ROLLINS'S X-RAY TUBE, WITH ANNULAR ANODE.

XVI—IS ROENTGEN LIGHT STRONGEST WHEN THE ANODE IS THE SOURCE?

In the work mentioned, Roentgen, Lodge and Rowland are quoted as saying that for the best generation of X rays the surface on which the cathode discharge is received should be the anode, and if we can judge from the types of tubes in the market, this is the accepted view. Early in the history of Roentgen's light, finding the rays were generated at both anode and cathode, I constructed a tube on the principle shown in Fig. 2, in which the rays produced by the anode impact, when this was acting as a cathode, were focused on the back of the platinum target and sent out of the field, avoiding in this way injury to the definition from the second light source. If we connect the hollow cooled target of this tube by a wire to the anode it becomes an anode. Now, while looking into the fluoroscope, if we cut the wire, the target has no metallic connection with the anode, and yet the useful light given off from the front of the target is not sensibly diminished. In trying to reconcile this with what I had read, I constructed a tube with terminals about at the places marked ET in the figure. Any one could be made anode. As the anode got out of line, so the target did not come between it and the cathode, the light diminished, until, as stated in Note 15, when the anode was on the opposite side of the cathode, the target was no longer a source of Roentgen light. Therefore, it may be safe to make this statement. If the target for the cathode discharge is in line between the cathode and the anode, practical considerations do not require it to be an anode, and, if powerful generators are used to excite the tube, it is better not to have the target the anode, for a cooled target having no metallic connection with the terminals, does not blacken the tube as quickly as when it has the function of an anode.

XVII—THERE ARE TWO SOURCES OF ROENTGEN LIGHT IN EVERY VACUUM TUBE.

Soon after Roentgen described his focus tube, Prof. E. Thomson applied this principle to the alternating current, inventing his double-focus tube, for use with any kind of generator. Though this gives two radiant points, they are near together and by cooling the target, as I do in my A-W-L tubes, and accurately focusing both cathodes, the two areas may be made very small and so near together as to improve the definition. This principle of Professor Thomson's is a fascinating one to the mind of a prudent experimenter, as it utilizes a wasteful and injurious development of power, while in my tube, shown in Fig. 2, the waste goes on though it produces no injurious effect, as the secondary light source, which is always present in every tube, even when excited by the so-called unidirectional currents, is sent out of the field. I am aware that some types of generators are said to give unidirectional currents in a vacuum tube, but this is probably an error of observation, for with all powerfully excited tubes with two terminals a second light source is painfully apparent.

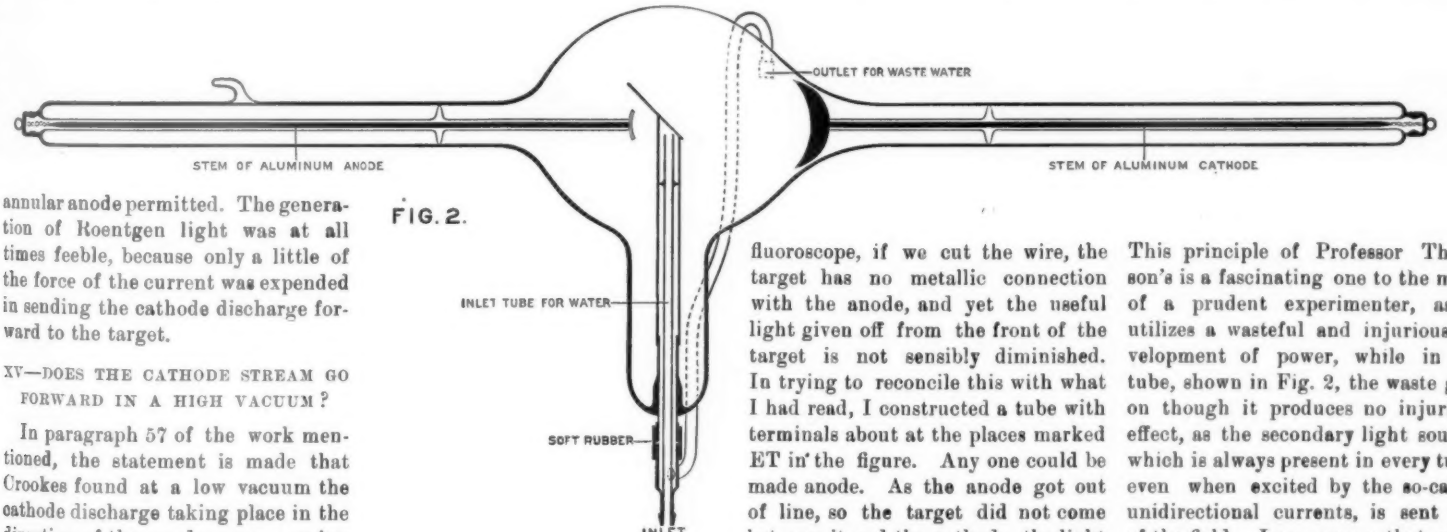


FIG. 2.

FIG. 2.—MODIFIED A-W-L X-RAY TUBE.

Chicago Telephone Company's Plans.

The following was written by Mr. A. S. Hibbard, general manager of the Chicago Telephone Company, for the *Times-Herald*, of that city:

"We have begun already to plan for a very large increase of business. We have completed arrangements for three new telephone exchanges, two downtown and one in the business district of the West Side. This will enable us to double the number of wires we can handle, and we feel that our improved facilities will soon be heavily taxed. One of the new exchanges is to be in the Title and Trust Building, and will be known as 'Central.' Another will be in the Manhattan Building. The growth of our business in the past three months has been very marked. Not only have more 'phones been put in, but the old 'phones are being used in many cases three or four times as much as before. It is evident that business men are compelled to resort to the telephone more and more all the time to handle their transactions, and that they have much more to do than before. One year ago the number of daily calls in Chicago was about 180,000. Now it is about 240,000, making an increase of 60,000 calls daily. The area which is reached by telephone service in Chicago is greater than that in any other city in America, and each man with a 'phone in this city talks more times and uses more miles of wire than anywhere else."

Collecting Fares in Boston.

[*From the Detroit Free Press.*]

Conductor—Fare, please.

Passenger—What is the fare?

Conductor—It is the tariff or tax levied by the corporation owning and controlling the charter and franchise of this street-car line on those persons who avail themselves of the opportunity afforded them by the company to secure more rapid and agreeable transportation than pedal locomotion.

Passenger—How much is the fare?

Conductor—Five cents, please.

The Christmas number of the *School Journal*, of New York, makes a fine appearance. It is finely illustrated and printed, and gives a good account of the publications relating to the holidays. As an educational paper it ranks high, as it clearly displays the great movement working to advance education in all parts of the world. Beginning its career in 1870, it has steadily advanced in influence year by year, having met with deserved prosperity.

ELECTRIC LIGHT FLASHES.

The Somerville, Mass., Electric Light Company is to issue new bonds to the amount of $100,000.

The Horton, Kas., electric light plant has been abandoned, and gas will be substituted. The town has been dark for a week. The stockholders state that the plant has been a financial failure from the beginning.

The Virginia Electric Company has been granted a franchise for power transmission for thirty years. The company expects to spend $1,500,000 in developing electrically the power of the James River for light and power.

The Colonial Electric Company, of New York, has been incorporated, capital, $25,000, to operate in Greater New York. Directors are Garrett S. Odell and O. H. Cheney, of New York, and Horace S. Andrews, of Brooklyn.

The Azusa, Cal., Electric Light and Power Company has chosen the following directorate for the ensuing year: O. H. Huber, V. M. Greever, J. W. Calvert, C. C. Casey, T. C. Bouldin, Evan Davis and S. F. de Voin.

The Missouri Electric Light and Power Company and the Edison Electric Company, St. Louis, Mo., have consolidated under title of Missouri Edison Electric Company. The new company will, it is reported, issue $4,000,000 of gold-bearing bonds.

The German Transoceanic Electric Company, with headquarters at Berlin, Germany, has been formed, with a capital of 10,000,000 marks, for the purpose of erecting electrical stations in America. A central station will first be established at Buenos Ayres for lighting.

Denver capital, known generally as the Moffat-Smith Syndicate, has ordered the machinery and appliances for the new electric plant at Goldfield, Colo., in the heart of the Cripple Creek district. This plant will cost $200,000 and will be ready for operation by the first of April, 1898.

The Winchendon, Mass., Electric Light and Power Company has elected the following officers for the ensuing year: Clerk, C. T. Stearns; directors, F. W. Russell, S. A. Greenwood, C. T. Bryant, C. T. Stearns, G. N. Goodspeed; treasurer, F. W. Nourse; auditor, D. H. Barnes.

The jury in the replevin suit of the Fort Wayne, Ind., Electric Corporation vs. the Franklin Electric Light Company, of Cape May City, N. J., has returned a verdict for the plaintiff company for $11,916.66, with $516.39 interest. Suit was brought to recover $16,700 and interest, the purchase money for the plant furnished by the plaintiffs.

CHICAGO TRADE NOTES.

The Western Electric Company is experiencing a somewhat heavy demand for interior conduit and fittings, of which it always carries a large stock.

Mr. Albert Mann, one of Buffalo's well known engineers, paid a short visit to Chicago last week in the interest of several manufacturers whom he represents. Mr. Mann speaks very encouragingly of the business condition in his territory.

The Central Electric Company, as is customary at this time of the year, is in the midst of taking the annual inventory, as every good business house should do. Unlike a great many concerns, however, this does not cause the slightest interruption or delay in the filling of orders, all of which speaks well for the splendid organization of this great supply house.

The Occident Club, a most attractive organization, composed of the majority of employés of the fairer sex at the Western Electric Company, gave an enjoyable Christmas entertainment on Monday evening, December 27, the club's spacious rooms being the scene of the festivities. A Christmas tree of ample proportions was of course provided, refreshments were in abundance and due homage was paid to Terpsichore, until tired feet and sleepy eyes warned the 600 jolly members that dawn was breaking.

As predicted in last week's issue of the ELECTRICAL REVIEW, trouble is brewing over the recent attempt on the part of the city to let contracts for some 1,100 additional arc lights for street lighting. Judge Tuley, on the fifth instant, handed down a rather sweeping decision, to the effect that not only was the municipal lighting ordinance invalid, but that it was beyond the power of the Council to appropriate money during the year in any case except where a great emergency existed. Mayor Harrison has put on his fighting clothes and declared in the face of Judge Tuley's injunction that the city would have and maintain a municipal lighting plant, and that neither the gas trust nor any lighting company would reap any profit from the fight made on Comptroller Waller's plan.

Chicago, January 7. C. E. K.

ITEMS OF INTEREST.

The Bennington & Hoosic Valley, Vt., Electric Railroad has been mortgaged to the International Trust Company, of Boston, for $250,000.

President Baldwin, of the Long Island Railroad, it is said, has under consideration a plan for equipping three of his lines with electricity.

J. W. Ferguson has just received the contract to build a station for the Kings County Electric Light and Power Company, in Brooklyn, to cost about $125,000.

The Clay County Telephone Company, of Clay Center, Neb., has elected the following officers for the ensuing year: President, L. G. Hurd, Harvard; vice-president, C. J. Furer, Fairfield; secretary-treasurer, J. F. Eller, Harvard. An annual dividend of 10 per cent was declared.

At the annual meeting of the Atlantic Telegraph Company, of Portland, Me., the following officers were elected for the ensuing year: President, John W. Deering; treasurer, John J. Donovan; clerk, Nathan D. Pratt; directors, John W. Deering, John J. Donovan, George P. Westcott, Portland; Thomas G. Gerrish, Nathan D. Pratt, Lowell, Mass.

The stockholders of the Cleveland & Chagrin Falls, Ohio, Electric Railway Company have elected the following directors for the ensuing year: F. D. Carpenter, L. M. Coe, E. J. Kennedy, William Prescott, V. A. Taylor, J. E. Ensign, C. F. Lane, George Simon, M. A. Sprague, C. E. Morganthaler, R. L. Palmer and F. M. Stearns. Officers were elected as follows: President, V. A. Taylor; vice-president, M. A. Sprague; treasurer, William Prescott; secretary, C. F. Lane; executive committee, F. M. Stearns, C. E. Morganthaler, L. M. Coe, J. E. Ensign and M. A. Sprague.

The New York & New Jersey Telephone Company was much annoyed the other night by the cutting of wires in lower Jersey City. Linemen reported that wires of the company in Tenth and surrounding streets had been severed. The police were notified, and James McCarthy, a lineman, 26 years of age, of Grove street, near Tenth, was arrested after he had descended from a telephone company's pole. He admitted to Justice Potts next day that he had cut the wires, but stated he had been employed to do so by a man whose name he did not know. McCarthy was held for the action of the Grand Jury.

Improvements in Transformers as Related to Electric Lighting.

The economic results obtained from the supersession of old-type transformers by those of most recent and improved manufacture, and the substitution of one large transformer for several smaller ones have been demonstrated very clearly and convincingly in a compilation of reports received from a number of electric lighting companies which have made the change. In almost every case the change has resulted not alone in a far more perfect operation of the system, perhaps a minor consideration, but in an actual concrete, tangible saving in dollars and cents.

Improvement in transformer construction and the use of larger units follow naturally after similar developments already completed in the machinery of many of the large central stations of our country. The replacement of a large number of transformers of small capacity, manufactured when the art of transformer construction was not so well known as it is to-day, by a few improved transformers of large capacity has produced, and is producing, results startling in their importance.

The first instance is that of a company operating in a town of 56,000 population in Massachusetts. In this case 57 small transformers, built in previous years, were supplanted by 18 of one of the latest types. The total light capacity of the superseded apparatus was 1,499 lights; of the newly installed transformers, 1,624. The total core loss of the old transformers was 5,866 watts; of the new only 1,348. So much for the electrical facts. The saving in dollars and cents is calculated as follows: 39.578 kilowatt hours are saved yearly by the change. The value of the saved energy may be estimated at $527.70, equivalent to a saving per light capacity per year of 36.2 cents. Neglecting all the advantages of the change, except those accruing from the decreased core loss, the expense will be met in one year and nine months.

The light capacity of the plant is increased nine per cent, the core loss decreased 77.5 per cent. Furthermore, on account of the decreased core loss, not less than 4,518 watts are available for sale at the regular rate with the present station apparatus. This enables the company to add 90 lamps to its circuits, producing an additional income of about $675.

The second instance is in another Massachusetts town. Here 40 new-type transformers supplanted 53 old ones. The total light capacity of those returned was 1,135 lights; of the new, 1,070. The core loss in the old-type transformers was 4,845 watts; of the new type, 1,343 watts. In this case the annual saving is 30,678 kilowatt hours or about $409, and corresponds to a saving per light per year of 35.2 cents. The expense of the change, counting core loss alone, will be covered in two years and nine months. Three thousand five hundred and two additional watts are available for sale; increasing the income by $525 per year; while by the use of lamps of a higher economy, some 535 kilowatt hours additional are also available for sale.

There are still three more striking cases, in Massachusetts, of benefits derived from a similar change. In the first the regulation of the station had been so poor that the lamp bills had increased to such an extent that the question demanded immediate attention. While the saving was comparatively small, the beneficial results brought about by the change have proved highly satisfactory. In the second, 81 small transformers of old type were replaced by three of a new type. The core loss of the returned transformers amounted to 2,568 watts; of the new ones, 280 watts. The resultant saving per annum is 20,043 kilowatt hours, or $267; the saving per light capacity per year, 25.74 cents. This is an all-day station and it is calculated that only eight and one-half months will be required to wipe out the investment. The third case involves the supersession of 193 old-type transformers by 37 new ones, the total light capacity of the former being 6,035 lights, and of the latter, 8,210 lights. The total annual saving is 51,203 kilowatt hours, or $683, and the total saving per light capacity, 14.68 cents. In five years and two months the cost of the change will be fully covered. The capacity of the plant has been increased 36 per cent, the energy required to operate it decreased 47.1 per cent; 5,845 additional watts were made available, and thus an additional capacity of about 116 lights was obtained without adding to the station apparatus. If these lights were burned but three hours daily the result would be an additional annual income of $960. On account of the improved regulations entailed by the change, high-efficiency lamps can be used and about 410 more watts saved. This adds $109.46 to the total annual saving.

Several interesting changes have also been made in the West. One instance in particular merits attention. The details of the change are not available, but by centralizing the transformer distribution the rate of switchboard income was changed from 4 cents to 12 cents per kilowatt. Another western plant reports that its 1,140-volt circuit equipped with old-style transformers showed six to seven amperes in the daytime, while with the new transformers only a fraction of an ampere is shown.

Facts such as these tend to prove not only that constant improvement is taking place in electrical apparatus, but that station managers are realizing that, to secure the most economical results on their systems, such improved apparatus must replace older types built when electrical knowledge had not reached its present high standard. A saving here, less trouble there, the extinction of a difficulty at another point, result in a general benefit which can be exactly calculated in dollars and cents, and thus tends to the general well being of the progressive station and communities in which the newer methods are adopted.

ELECTROSTATIC GROUND DETECTOR.

"Success."

Success is the name of a new monthly magazine which describes itself as an up-to-date journal of experience, encouragement, progress and self-help. It is published at 3 Cooper Union, New York city, and is edited by Orison Sweet Marden. The initial number is very creditable, the illustrations and typography being of a high degree of excellence. The selection of reading matter is such as to carry out the title of the journal, and if future numbers live up to the beginning made it will be a valuable publication.

Electrostatic Ground Detector.

A new ground detector, to take the place of the transformer and lamp method, which, although hitherto extensively used, has never given more than a rough indication of the condition of the lines, is announced by the General Electric Company. In the transformer and lamp method of ground detection, the extent of the ground is indicated by a lamp in the secondary circuit of the transformer, but on account of the capacity of the lines the lamp nearly always glows, and the actual condition of the line is difficult to ascertain.

The new device, illustrated on this page, is a switchboard instrument, and is similar in construction to that of electrostatic voltmeters used in laboratory work. Briefly, it consists of four rigidly fixed sheet-metal quadrants, between which is space for the accommodation of a vane carrying an indicating needle. The two lower quadrants are connected internally to the lower binding post for connection to the ground; the two upper to the right and left binding posts respectively for connection to the lines.

The vane, with its needle, is pivoted at the center of the circle formed by the four quadrants, and is slightly counter-weighted to balance the weight of the needle.

In common with all electrostatic instruments, the operation of this ground detector depends on the tendency of the vane to place itself in the position giving the greatest condenser capacity. If no ground exists on the line, the vane lies across the shortest path between the positive and negative quadrants, the right and left upper quadrants, and the needle points to zero. If, however, either side of the system be grounded, the two lower quadrants cease to be neutral, the system is out of balance, and the vane, taking a new position, deflects the needle to the right or left, indicating the grounded side. A special feature of the construction is that the moving mechanism is insulated, and has no electrical connection with either side or with the ground. If it were connected to either side of the line, or to the ground, a burn-out might possibly result, but being insulated, the moving mechanism can come into contact with one of the quadrants without causing any damage. It may be used for temporary connection to any desired line, or one for each feeder may be permanently installed. This electrostatic ground detector is constructed for 1,000, 2,000, 5,000 and 10,000 volts, and is set in a black japanned case, with cover, finished in polished nickel.

ADVANCE INFORMATION

New Electric Railways.

INDIANAPOLIS, IND.—The Elkhart, Goshen & Southern Railway has been incorporated. Capital stock, $250,000. The company will build an electric railway, connecting the cities of Goshen and Elkhart and Lake Wauwasee. William H. Holcomb, of Chicago, is at the head of the enterprise.

MUSKEGON, MICH.—Six Muskegon capitalists are back of the project to build an electric railway to Grand Rapids.

HARRISBURG, PA.—The Allentown & Emaus Street Railway Company, which is to exist for 999 years and construct and operate a road eight miles long, from the Lehigh Valley Traction Company's tracks in Ameyville to Emaus and through Upper Milford township, has been granted a charter. It will also construct a spur to Salsburg township. The capital is $50,000, and T. J. Crelley, Allentown, is president; J. D. Sohwartz, P. F. Cannon and W. I. Savage, Allentown, and W. N. Wiend, Emaus, are the directors.

NEALETON, PA.—Kittanning & Ford City Street Railway Company, of Armstrong County, to run from Nealeton to Kittanning, seven miles. Capital, $50,000.

BAY CITY, MICH.—A company has been organized to construct an electric road from Bay City to Sebewaing.

SISTERSVILLE, W. VA.—The company which will build the electric road from this city to a point on the B. & O., near Clarksburg, has been incorporated by R. H. Freer, A. B. Smith, C. Y. Benedum, W. R. Fitch, D. H. Morey, H. W. Smith and F. C. Clemmens.

DELHI, N. Y.—There is considerable talk of an electric road being built from Delhi to Andes, with a branch to Bovina Centre. The right of way has already been secured, and the name proposed is the Delaware Valley Railroad Company.

FORT LEE, N. J.—The Bergen County Traction Company, now operating a trolley system between this place and Englewood, is making preparations to construct a branch from Leonia to Hackensack.

AINEYVILLE, PA.—Allentown & Emaus Street Railway Company, of Lehigh County, to run from this place, a suburb of Allentown, to Emaus, eight miles, has been incorporated. The capital is $50,000.

LANSING, MICH.—The Bay, Tuscola & Huron Railway Company has been incorporated with a capital stock of $100,000, and will build a line of electric railroad from Bay City to Sebewaing, Huron County.

EVERETT, MASS.—The West End Street Railway car-house was destroyed by fire recently, together with 90 electric cars. The loss on the building is estimated at about $30,000, and on the cars at $120,000.

TOPEKA, KAS.—The Kansas City, Lawrence & Topeka Electric Railway and Power Company, incorporated, to construct an electric line between Kansas City and Lawrence and Topeka, Kas., to do freight and passenger business. Capital stock, $3,000,000.

NEWTOWN, PA.—The new trolley line of the Newtown Electric Railway Company, between this place and Langhorne, is now running.

JOHNSTOWN, PA.—A charter has been granted to the Lykens & Williams Valley Street Railway Company, with a capital stock of $200,000, to construct and operate an electric line between this place, Schuylkill County, and Lykens, Dauphin County, a distance of 10 miles. The officers are: President, John B. Skyles, Martinsburg, Pa.; directors: C. C. Cocklin, William E. Fletcher, of Harrisburg; B. W. Brown, Derry; Wm. Stewart, of Indiana, and S. Ritter Ickes, of Harrisburg.

TOLCHESTER, IND.—An electric road from this place to Chestertown is being talked of.

Electric Light and Power.

RACINE, WIS.—A private electric light plant has just been established in this city to illuminate the residences and property of Stephen Bull, F. K. Bull, Frederick Robinson and A. Arthur Guilbert. The cost is estimated at $7,000.

TROY, N. Y.—The Saranac Lake Light, Heat and Power Company has been incorporated, with a capital stock of $100,000. The directors of the company for the first year are Orlando Blood, Wallace Murray and Perley A. Gould, of Saranac Lake, and F. A. Isham and C. S. Stackpole, of New York city.

OZARK, ALA.—A contract for the construction of an electric light plant for this place, to be completed within 90 days, has been let.

ROMEO, MICH.—The municipal electric light plant has been completed. The plant cost $13,000.

PERU, ILL.—Peru-LaSalle Gas Light and Power Company has been incorporated. Capital stock, $130,000. Incorporators, W. B. McKinley, Charles Zilly and F. M. Zilly.

LARNED, MO.—Citizens' Light and Power Company has been incorporated; capital stock, $62,500. Directors, E. E. Frizell, Herbert Horter, S. S. Sleeper, Lawrence Fox and A. H. Jacob, all of Larned.

STEELTON, PA.—The Steelton Electric Light Company have decided to extend their line through Enhaut to Oberlin.

DENVER, COLO.—The Ward Electric Light and Power Company, with a capital stock of $15,000, has been incorporated; C. W. Betts, J. A. Kilton and A. W. Olsen incorporators. The company will operate and maintain an electric light plant in Boulder.

GUTHRIE, OKLA.—A territorial charter has been granted to the New Electric and Gas Light Company, of Guthrie. The incorporators are E. D. Mix, W. B. Crossland and C. R. Brooks. The capital stock is $20,000.

MEDFORD, WIS.—An electric lighting plant will be established at this place by a local organization of business men.

KERRVILLE, TEX.—The Kerrville Electric Light, Heat and Power Company, with a capital stock of $10,000, has been incorporated. Incorporators, Charles Schreiner, A. C. Schreiner and L. A. Schreiner.

MINNEAPOLIS, MINN.—The Gladstone Electric Lighting and Power Company petition of the stockholders, for the dissolution of the company, has been granted.

CORBIN, KY.—An electric light plant will be established.

FORT WAYNE, IND.—The Fort Wayne Electric Corporation contemplates the erection of an addition to its plant.

SOUTH BOSTON, MASS.—The Boston Electric Light Company will erect a plant.

BALTIMORE, MD.—The Consumers' Ice Company, August Fenneman, president, will erect an electric light plant to supply Electric Park, at Arlington.

WESSON, MISS.—R. S. Furser has been awarded contract for electric light plant.

BLACKSBURG, VA.—S. A. Bross & Company will install an electric light plant in flour mill now in course of erection.

LAUREL, MD.—George W. Waters, Jr., Town Treasurer, may be addressed concerning contemplated purchase of electric plant.

CORUNNA, MICH.—Clarence Hawley, of Detroit, has been granted franchise for an electric light plant for Corunna.

HYATTSVILLE, MD.—An electric light plant will be erected, and funds will be raised for same.

New Incorporations.

CONCORD, N. H.—The New London Electric Company, with a capital stock of $5,000, has been incorporated.

INDIANAPOLIS, IND.—The Princeton Heating and Ventilating Company has been incorporated. Capital stock, $5,000.

CHICAGO, ILL.—A. D. Scott Manufacturing Company has been incorporated. Capital, $25,000; manufacture electrical goods. Incorporators, Ashley D. Scott, Samuel S. Scott, Watson B. Farr, all of St. Louis, Mo.

CHICAGO, ILL.—The George B. Swift Company has been incorporated to do a contracting business in steam and electric railways. Capital stock, $50,000. Incorporators, George B. Swift, Charles C. Scouller, G. F. Jenkins.

ST. LOUIS, MO.—Manhattan Electric Company, with a capital stock of $4,500, has been incorporated. Elliot Jones, Albert E. Boeschenstein and George J. Percival, incorporators. The firm will do a general electrical construction and supply business.

New Telephone and Telegraph Companies.

ROME, OHIO—The telephone line from this place to Shenandoah has been completed.

NICHOLASVILLE, KY.—The Nicholasville Telephone Company has been incorporated, and is ready for business.

Increase of Capital.

NEW YORK, N. Y.—The New York & Staten Island Electric Company has increased its capital stock from $500,000 to $1,500,000.

Business Troubles.

CLEVELAND, OHIO—The Venus Incandescent Light Company has made an assignment to W. H. Schwartz.

Kindred.... ...Interests

A Correction—The General Electric Company desires to advise all holders of their complete incandescent lamp catalogue, No. 1012, of an error in the appendix, in the table on page 58. The figures .662 in the column "Life Factors" should be .562. They kindly request that all holders of the catalogue make this correction.

Mr. Hugo Reisinger, 38 Beaver street, the well known importer of "Electra" high-grade Nuernberg carbons, and dealer in high-grade battery carbons, carbons for microphones, telephones, etc., will remove to 11 Broadway on February 1. Mr. Reisinger is a very large importer of carbons, and their excellence is recognized in the electrical field all over the United States. The ELECTRICAL REVIEW congratulates Mr. Reisinger over the evident increase of his business requiring the improved quarters, and trusts that the year 1898 will be a highly prosperous one.

Armorite Interior Conduit is now generally recognized by architects and contractors as a standard for high-grade interior work. This conduit as it is now made with the light steel wall and light lining is claimed to be superior to the old style heavy conduit, and is said to be displacing entirely the old type of tubing. The Electric Appliance Company, of Chicago, are carrying a large stock of light wall steel Armorite in Chicago and are doing a handsome business on the same. They claim that Armorite is easier to install than any other conduit that has yet been placed on the market.

The Walker Company has been obliged to measure the bridges and "cuts" on several of the roads running from Cleveland to New York, in order to decide how to ship the huge generator nearing completion in their shops at Cleveland for the Brooklyn Heights Railway in Brooklyn. The spider of cast-iron of this machine, without shaft or commutator for the laminations, weighs 63,000 pounds. The Cleveland shops of the Walker Company are unusually active with work of this heavy nature, in spite of the fact that a number of large shipments were made around the last of the old year.

The Royal Incandescent Lamp Company is a new organization just entering the manufacturing field, with factory and offices at Cleveland, Ohio. The company is just completing the equipment of shops with modern machinery, for the production of incandescent lamps. The aims of this company, as outlined to a representative of the REVIEW by Mr. Roberts, the manager, who, by the way, has had long experience in electric lighting matters, are to produce a lamp of unrivaled quality at a low price, and to exchange all lamps, which, when burned at normal voltage, for which they are made and marked, if they are found defective.

The new building of the K & W Company, at Pittsfield, Mass., is now fully equipped for manufacturing, and the company are now introducing the "Hardy" incandescent lamp. This lamp is the product of the genius of Mr. S. M. Hardy, a gentleman who has for many years made a study of the construction of the incandescent lamp. The upper floors of their light and spacious factory will be entirely devoted to the making of incandescent lamps. The shops are excellently arranged for every detail of the work. On another floor the production of the specialties made by this company are carried on. These specialties include the composite dynamo, dynamo brush, commutator compound, hanger-boards and spark-arresters. The Messrs. W. A. and F. R. Whittlesey and J. H. Kilman, well known in the New England business world, are identified with the management of the K & W Company.

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WANTED, by leading firm, young, capable and hustling salesman to canvass electric lighting stations. Address, stating age, salary expected and references,

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Care ELECTRICAL REVIEW,
Times Building, New York.

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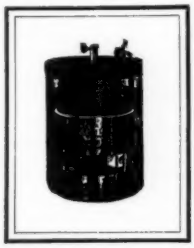

The increasing popularity of the Gordon Primary Cell among the Fire Alarm and Police Signal Service of the leading cities, the railroad, telegraph and telephone companies, and the general adoption of our steel enameled cell for gas-engine, launch and marine service attest most highly to its merit, efficiency, adaptability and economic features.

If you wish to read the testimonials in its behalf, and learn its full description, kindly apply for circular and price-list, to

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Successors to White-Crosby Company, and J. G. White & Co.,
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SUCCESSORS TO A. L. BOGART,
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POSITION WANTED—with Telephone Company by young electrician, aged twenty, with good business education, and two years' experience in all branches of telephone work, and considerable experience in electric light wiring, etc. Will do all kinds electric work; experienced in line work. Would like to take charge of work of independent exchange. Address "20," care ELECTRICAL REVIEW, Times Building, New York.

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Northern Pacific & Alaska Mining, Transportation & Trading Company, owning thirty-five valuable quartz veins, and nearly a thousand acres of placers in richest Alaskan gold fields, will run steamers from Seattle and San Francisco to Snug Harbor, Cook's Inlet (where will be established a great commercial depot) and connect with only feasible rail route to Yukon, Klondike and Copper River Districts. Offers to investors unique proposition. Correspondence with first-class local or traveling salesman desired. Address (with reference) at Equitable Building, New York.

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Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED DECEMBER 28, 1897.

596,160 Electric heater; H. Helberger, Munich, Germany—In an electric heater, the combination with a body to be heated, said body being a conductor of electricity, of a wire surrounding the same, a series of beads of refractory material strung upon a wire and in contact with the body to be heated, and a layer of refractory material outside the beads.

596,172 Lead for electrical sounding; J. Mohs, Brandenburg, Germany.

596,182 Electric railway; W. B. Potter, Schenectady, N. Y.

596,186 Phase regulator; C. P. Steinmetz, Lynn, Mass.—The combination in an alternating-current circuit of an electro-dynamic phase controller having inducing and induced members, means for increasing the self-induction of the induced member, and a source of power driving said controller above its normal speed.

596,190 Induction wattmeter; E. Thomson, Swampscott, Mass.

596,193 Trolley base cushion; W. G. Wagenhals, Dayton, Ohio.

596,197 Electrical protective appliance; A. S. Williams, Newton, Mass.—The combination in an electro-magnetic appliance of the winding thereof; a mass of easily fusible material contiguous thereto; a sheet-metal heat collector contiguous to the said winding and also the said fusible mass; and circuit-changing devices controlling protective connections.

596,201 Electrical signaling system; J. P. Buchanan, Boston, Mass.

596,224 Trolley rail; W. A. Willard, Jr., Hull, Mass.

596,226 Electric signaling system; A. J. Wilson, Port Chester, N. Y.

596,229 Underground junction box for electric conductors; W. A. Bossert, Utica, N. Y.—The insulating stuffing box, consisting of a body portion, an insulator bushing held therein, a cap, an insulating bushing held therein and an elastic packing between the adjacent ends of the bushing.

596,236 Electric gas-lighting device; A. L. Bogart, New York, N. Y.

596,272 to 596,274 Electric bicycle; H. W. Libbey, Boston, Mass.

596,276 Telephoning from cars in motion; H. W. Libbey, Boston, Mass.—In a railroad a wheel having a ring of conducting material let into edge of its flange, but insulated therefrom, and a ring of conducting material attached to the inner side of the flange, but insulated therefrom.

596,281 Motor vehicle; H. C. Spaulding, Boston, Mass.—In combination, the expansible pulleys, with means for operating them, and connections controlling said operating means, including a lever and a yielding part, whereby the lever may be set and the parts may assume their positions gradually.

596,283 Electric current meter; R. P. Wilson, London, England.

596,290 Coin-controlled electric toy; F. Street, Philadelphia, Pa.

596,306 Dynamo electric machine; P. W. Powers, Pittsfield, Mass.—In a dynamo-electric machine having a rotating inductor, laminated polar projections separately fastened to the inductor core by dove-tail fastenings.

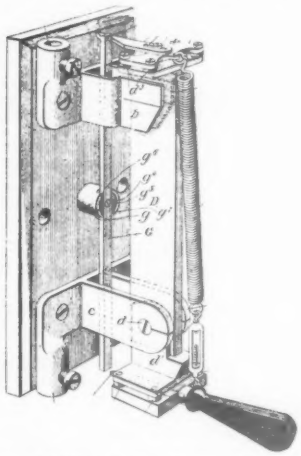
596,320 Printing telegraph; B. A. Brooks, Brooklyn, N. Y.

596,335 Tide-motor; E. Naumann, Homestead, Pa.—In a tide-motor, a waterway, gates located in said waterway, water-wheels provided with blades carrying reversible buckets having the mouth against the current, a locking pin engaging the blade frame and bucket, to prevent said bucket from turning.

596,336 Car-wheel grinding machine; C. E. Norton, Manchester, Ct.

596,358 Electric call-box system; W. T. Budds, Charleston, S. C.

596,363 Quick break switch; R. C. De-



No. 596,363.—QUICK BREAK SWITCH.

mary, Buffalo, N. Y.—In a switch or circuit-breaker, the combination of a base, circuit terminals mounted thereon, a switch blade pivotally secured to one of the terminals and co-operating with the other, a handle pivoted to the first named terminal and movable independently of the switch blade, a spring connection between the switch blade and the handle, a locking lever pivotally secured to the switch base, and swinging in a plane at right angles to the switch blade, a catch projecting from the latter and designed to engage with said locking lever, to hold the blade against the action of the spring while the switch handle is partially moved, and means for releasing the switch blade from the locking lever when the maximum tension of the spring is obtained.

596,364 Thermic motor; M. J. Eichhorn, Chicago, Ill.

596,418 Magneto electric signaling apparatus; A. S. Williams, Newton, Mass.

596,426 Annunciator; A. D. Neale, Kittaning, Pa.—An improved annunciator, including a vibratory support, a call indicator adapted to move in a plane transverse the line of vibration of the support and formed with a notched opening, the edges of the said indicator being inclined toward the entrance to said opening to guide the support thereinto when setting the indicator.

596,456 Trolley for electric railway cars; E. Cone, Chicago, Ill.

596,457 Combined manual and automatic switch; R. L. Haley, New York, N. Y.

ISSUED JANUARY 4, 1898.

596,483 Electric fan; O. F. Conklin, Springfield, O.

596,496 Telephone; Wm. Gray, Hartford, Ct.

596,506 Electric switch; W. S. Hill, Hyde Park, Mass.—In an electric switch, the combination of the blade having a recess formed in the same, near an end thereof, and having an opening leading from said recess through the end of the blade to the exterior of the same, a yoke, an insulating block placed intermediate of said blade and yoke, a nut seated in the recess formed in said blade, and a screw passing through said yoke, insulating block and the opening in the end of said blade and engaging with said nut.

596,509 Signaling apparatus for telephone systems; F. J. Holmes, Cleveland, Ohio.

596,512 Automatic stop-motion snap switch; J. D. Ihlder, Yonkers, N. Y.

596,513 Compound brake for electric elevators; J. D. Ihlder, Yonkers, N. Y.—The combination with the brake device of an elevator engine, of a shaft, two eccentrics supported by said shaft, means for operating the eccentrics independently, and connections between the eccentrics and the brake device.

596,514 Safety magnet brake; J. D. Ihlder, Yonkers, N. Y.

596,515 Starting box for electric motors; J. D. Ihlder, Yonkers, N. Y.

596,567 Converter for monophase currents; A. Blondel, Paris, France—A converter for monophase alternating currents, comprising in combination an armature having a primary and secondary winding, a closed or nearly closed magnetic frame surrounding said armature, a tertiary winding relatively stationary with reference to said magnetic frame, and a quarternary exciting winding.

596,582 Means for varying candle-power of incandescent electric lamps; C. E. Felch, Natick, Mass.

596,609 Supervisory signal for telephone switchboards; F. R. McBerty, Downer's Grove—The combination with a connecting plug and a normal resting socket thereof, a signaling instrument comprising a magnet and a target controlled thereby associated with the plug, of a mechanical device in the plug socket to be operated by the plug adapted to conceal the signal.

596,610 Signaling system for telephone trunk lines; F. R. McBerty, Downer's Grove, Ill.

596,625 Plug and spring jack for telephone switchboards; C. E. Scribner, Chicago, Ill.—The combination in a connecting plug, of a cylindrical tip of small diameter, a contact collar of larger diameter at the rear of said tip, a contact sleeve of still larger diameter at the rear of said collar, and insulating collars separating the different contact portions.

596,626 Spring jack for telephone switchboards

596,627 Annunciator for telephone lines.

596,628 Supervisory signal for telephone switchboard.

596,629 Testing apparatus for multiple switchboard.

596,630 Apparatus for telephone switchboards; C. E. Scribner, Chicago, Ill.—The combination with a telephone line, means for making connections therewith, an electro-magnet associated with the telephone line, and mechanism actuated by the electro-magnet, of a local circuit including the electro-magnet together with a supervisory signal, a relay responsive to currents in the line and a shunt of said signal controlled by the relay.

596,651, 596,652 Press for making insulators; H. M. Brookfield, New York.

596,678 Ball bearing and eccentric; F. H. Heath, Tacoma, Wash.

596,696 Electric oven; L. E. Custer, Dayton, Ohio.

596,719, 596,720 Magnetic ore separator; L. G. Rowand, Camden, N. J.—In a magnetic separator, the combination with a conveyer adapted to carry the material to be treated, of a magnet above said conveyer and adjacent thereto, the pole-piece of the magnet extending towards each other at their free ends, and a discharge belt crossing the conveyer belt between said belt and the magnet and passing between the free ends of the pole-piece.

596,729 Support for electric lamps; O. C. White, Worcester, Mass.

596,774 Electric signaling apparatus; F. B. Herzog, New York, N. Y.

596,791 Voltaic battery; H. E. de Rufs de Lavison, Neuilly-sur Seine, France.

596,806 Apparatus for telephones; F. B. Cook, Chicago, Ill.—In a telephone system, two connected subscribers, a central office, means for preventing the calling of one subscriber when the other rings off, consisting of calling generators at each subscriber's station and signal bells for each subscriber's station unresponsive to the current from the calling generator of the other subscriber.

596,808 Telephone transmitter; D. A. Fleming, Indiana, Pa.

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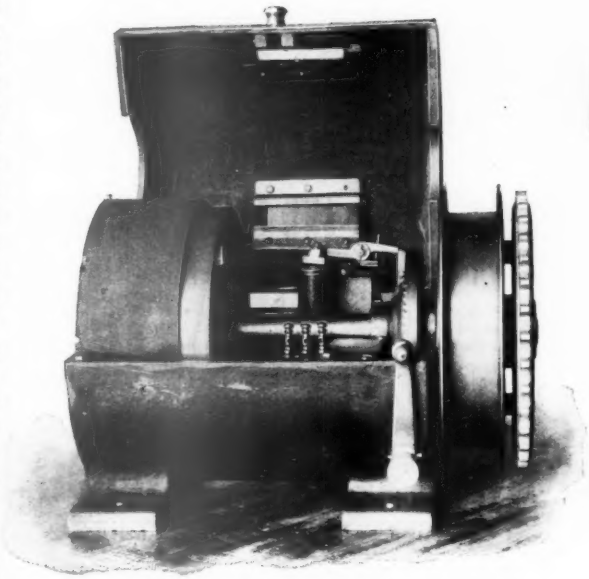

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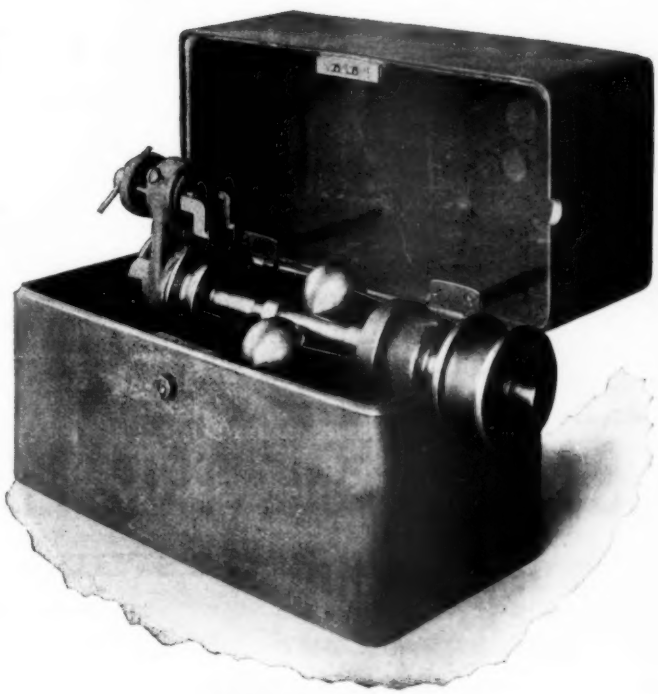

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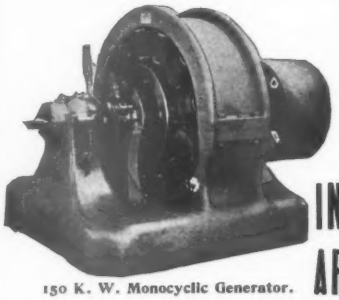

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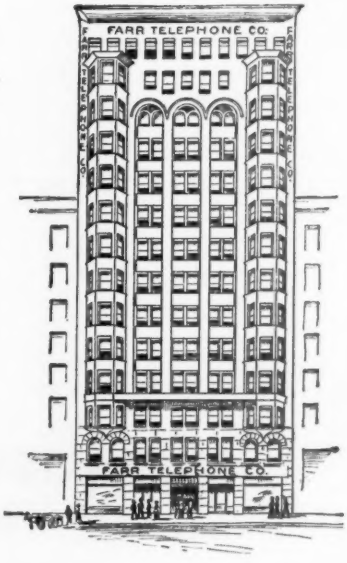

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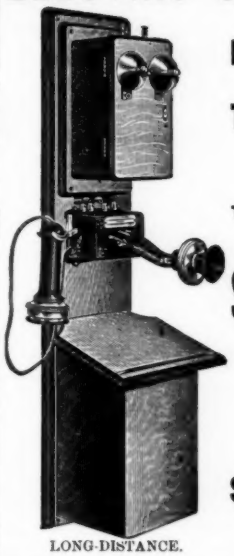

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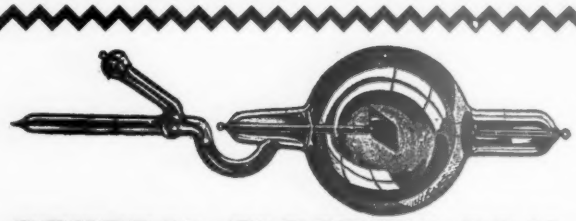

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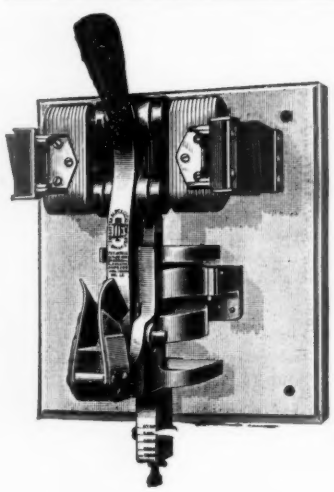

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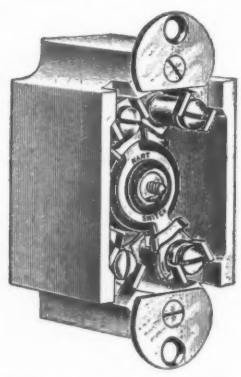

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